Contributions to Finance and Accounting

Shame Mugova
Joseph Olorunfemi Akande
Odunayo Magret Olarewaju *Editors*

Corporate Finance and Financial Development

An Emerging Market Perspective on a Post-Crisis World

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Contributions to Finance and Accounting

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Preface

Finance and growth underscore the interaction between corporate finance and financial development. Financial development is expected to enhance corporate financial access, hence the growth of economies. The preoccupation of emerging markets is growing their economies, which is a function of the real sector driven by industries and small- and medium-scale enterprises alike. Financing these activities has historically been dependent on the robustness of the capital and money markets recently facilitated by the growth in Information and Communication Technology (ICT), including the transition to the new industrial revolution where machines are beginning to replace iterative human activities, thus making access to finance more prevalent than were previously experienced. Therefore, beneath every economy that has undergone drastic transformations are healthy corporate finance spur by financial development.

On this basis, this volume addresses corporate finance with a particular focus on financial development within emerging markets context, especially in the post-crisis era. The emerging market is informed by its vulnerability to the rapidly changing financial systems, financial infrastructure, and financial disturbances. Contributions received provided insights in these areas using data from Africa, Asia, and North Africa, India, Sub-Saharan Africa, and Tanzania by authors across the globe.

Biswas and Mukherjee linked board representation to corporate finance, providing evidence that having a higher share of directors with financial expertise impacts firms' credit risk, which is critical for financial development. On their part, Younsi, Bechtini, and Lassoued found a threshold between finance and growth, implying that at a certain point, financial development may become the antithesis to issues of poverty and inequality. Considering the causality between growth and financial development based on Asian and North African data, their result suggested caution in identifying the threshold at which financial development is good for growth, without which it produces negative feedback. For Jumanne, Akande, and Muzindutsi, reforms in the form of regulatory frameworks have implications for the development and resilience of the banking system, especially within the Tanzanian financial environment having implications for financial development and

ultimately corporate finance in terms of financial access. To David Olayungbo and colleagues industrial production increases carbon emission whilst financial development is a valuable tool to reduce it through financial institutions financing projects that support low emission. In India, Biswas and Sinha averred that the relationship between bank mergers and the cost of capital has a bearing on corporate financial development. They found a higher cost of capital in terms of equity to borrowers as against the interest rate documented for developed economies. According to Menyari, foreign direct investment and tourism are other factors that impact broad money and credit to the private sector in Africa. While Owoeye, Idowu, and Ogunsola considered the implication of ICT for finance growth in Africa. The authors argued that although ICT influences growth, their evidence showed that ICT negatively impacted financial development. In another contribution, Ismail delved into the SMEs dimension. He documented the implication of financial resources development at the micro-level for SMEs development in terms of performance, especially regarding access to finance. Yinusa, Akinlo, and Adejumo analysed the importance of the real economic sector for financial development using data from Sub-Sahara Africa.

The culmination of the above contributions unveiled some of the corporate finance issues that bother on financial development in the emerging markets of Asia and Africa. These issues range from ICT, economic growth, regulatory frameworks, merger, to even tourism, to mention a few. The findings suggest enormous implications for improving corporate finance and financial development in supporting the real sector for the growth of the emerging markets economies.

Durban, South Africa — Shame Mugova
Mthatha, South Africa — Joseph Olorunfemi Akande

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Corporate Finance and Financial Development: An Introduction

Shame Mugova and Joseph O. Akande

Abstract In recent years, the discussion about the relationship between corporate finance and financial development has taken center stage. This chapter offers a comprehensive overview of financial development theory. Emerging economies are susceptible to rapidly changing financial sectors and products as well as financial upheavals. We seek a deeper understanding of financial development issues that are unique to emerging markets which can be gained by looking at the broader concepts that are topical in the region, especially in the post-crisis era.

Keywords Financial markets · Financial development · Capital · Banks · Banking · Stock market

The global financial crisis reflects the growing interdependence of states and markets that cannot escape the linkages and spillovers of an integrated world economy. The financial crisis of 2008 had its origins in an asset price bubble that interacted with new kinds of financial innovations that masked risk; with companies that failed to follow their own risk management procedures; and with regulators and supervisors that failed to restrain excessive risk-taking (Baily et al., 2008). The period after 2008 in emerging economies and developing countries financing had already fallen short of the spending needs to achieve the SDGs by 2030, and fiscal space was limited by rising public debt levels and servicing costs (OECD 2020). The crisis of 2008 and that of 2020 made firms, individuals, and households more conscious with how they spend and devised better ways of managing financial resources. The COVID-19

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pandemic induced chaos and turbulence in financial markets (Gunay, 2020). Most firms were affected by the two crises; however, the stock performance of most industries started to recover following the announcements of quantitative easing (Chen & Yeh, 2021).

The financial development plays a pivotal role in financing of firms. Finance managers need to understand the level of financial development as this has a bearing on the firm's access to capital. Raising funds requires in-depth knowledge of both money and capital markets. The cost of capital used to evaluate investment decisions includes parameters such as interest rates that are largely influenced by financial development. It should be highlighted that an underdeveloped financial sector results in high demand for capital relative to supply which pushes the price of capital up. On the other hand, a more developed financial sector can result in high supply of capital relative to demand; therefore, the price of capital will be lower. A finance manager thus needs to be aware of the firm's level of access to capital markets and ensure that it is well-funded with the required working capital at optimal cost, i.e., neither too high nor too low.

Financial development consists of institutions, instruments, markets, and the regulatory framework that enable the offering of credit. There is no universal measure of financial development; therefore, several proxies are used, including the depth, size, access, and soundness of the financial system. A measure of financial development can be obtained by examining the performance and activities of the financial markets, banks, bond markets, and financial institutions Adnan (2011). The level of a country's financial development is typically measured by the services provided by financial intermediaries, for example, the size of banks to gross domestic product (GDP), the size of equity to GDP, and credit issued to private firms (Ge & Qiu, 2007). Rajan and Zingales (1998) found that firms in industrial sectors with a greater need for external finance grow faster in countries with well-developed financial markets. The presence of financial constraints, for instance, the difficulties a firm may find to access capital markets, acts as an obstacle to firms' investment and growth (Bajo-Rubio & Berke, 2018).

The growth of economies mean that both banks and markets become larger relative to the size of the overall economy (Cull et al., 2013). Financial development lead to improved banks' screening procedures which increases capital market investors' confidence in the quality of firms with corporate debt, which stimulates better informed trading in the capital market and thus capital market evolution (Cull et al., 2013). The study by Asteriou and Spanos (2019) in Europe shows that before crisis, financial development promoted economic growth, while after the crisis, it hindered economic activity. Finance literature explains that financial intermediation mobilizes savings, allocates resources, diversifies risks, and contributes to economic growth. It promotes growth because it enables a higher rate of return on capital. Financial stability promotes trade and commerce activities those results into economic growth (Adeniyi et al., 2019). There is a long-run association between financial innovation, stock market development, and economic growth (Qamruzzaman & Wei, 2018).

The prices of securities are observable, while financial intermediaries are opaque. Bank loans are the predominant source of external funding in all countries (Gorton & Winton, 2003). Countries with poorly developed financial markets usually have small stock markets. An efficient financial system increases the amount of savings and investments (Amoah et al., 2020). If aggregate wealth were not pooled to fund enterprises, firm size would be constrained by lack of capital (Temin, 2004). Financial development is an important vehicle which provides firms' capital needs and households' investment requirements.

1 Financial Intermediaries and Financial Markets

Financial development is premised on financial intermediation which is the use of a financial institution to allocate funds between borrowers and lenders or households/firms with deficit and those with surplus. This enables pooling of risk and information costs and an efficient payment system (Di Matteo & Redish, 2015). The financial sector consists of institutions, instruments, markets, and a regulatory framework that enable credit to be offered. It is made up of two components, financial intermediaries and financial markets. Financial intermediaries are firms that mobilize surplus funds in the economy and lend to companies that require resources for investment. While financial institutions' investors do not contract with firms, in contrast, in financial markets, investors contract directly with firms, thereby creating marketable securities such as shares (Gorton & Winton, 2003). Banks have existed since ancient times, taking deposits from households and making loans to economic agents requiring capital. The financial system transfers funds from savers to borrowers, both households and corporates. To do so, it must pool funds and screen and monitor borrowers (Philippon, 2015). Safe and efficient payment systems are the most critical segment in undisturbed financial system functioning (Babić, 2017) The financial sector provides a means of payments, easing the exchange of goods and services. The functions of the financial system include providing insurance (diversification, risk management) and information (trading in secondary markets) (Philippon, 2015).

1.1 History of Banking

In early civilizations, a temple was considered the safest refuge because it was a strong building with a sacred character which itself might discourage thieves (Gascoigne, 2001). In ancient Egypt and Mesopotamia, gold was kept in temples for safety. The gold would just be in storage, while there was demand for it among traders and government. The emergence of banking was around 1800 BC through priests in Babylon at the time of Hammurabi. The priests issued loans using gold that

was in their custodian. In Greece and Rome, banks engaged in lending activities took deposits and also changed money. In the Bible, Jesus famously droves the money changers out of the temple in Jerusalem (Lambert, 2014). The fall of the Roman Empire resulted in trade decline and banking only started to revive again in the twelfth and thirteenth centuries in the Italian towns of Florence and Genoa (Lambert, 2014).

In the sixteenth century, a German family called the Fuggers from Augsburg became very important bankers (Lambert, 2014). In England, banks developed in the seventeenth century. Banks emerged in the seventeenth century in England during that time goldsmiths took gold deposits for safekeeping and would give a note promising to pay the bearer on demand (Lambert, 2014). Traders later began to exchange these notes because it was convenient and safer. The goldsmiths later started to create loans out of the gold deposits and would lend in return for a high interest rate. Goldsmiths also paid interest to people who deposited money in order to attract their savings (Lambert, 2014). People needed to borrow for personal needs, while governments borrowed especially during wartimes. The government borrowed money from affluent people and later repaid them with interest from taxes collected (Lambert, 2014).

1.2 History of Stock Markets

Stock markets emerged when countries in the New World began international trade (Bramble, 2016). Merchants wanted to start big businesses which required substantial amount of capital which cannot be raised by a single merchant. The Dutch originated joint stock companies where groups of investors pooled their savings and became business partners and co-owners with individual shares in their businesses to form joint-stock companies (Bramble, 2016). In 1602, the Dutch East India Company issued the first paper shares (Bramble, 2016). The shares allowed businesses to raise capital and enabled investors to buy or sell their stock.

The idea was so successful that the selling of shares spread to other maritime powers such as Portugal, Spain, and France. Eventually, the practice found its way to England (Bramble, 2016). During the Industrial Revolution, other industries began using this idea to generate start-up capital (Bramble, 2016). The system allowed capital mobility, financed discoveries, and led to the growth of modern industrialized manufacturing. The growth in number of shares and trading resulted in the need for an organized marketplace. Stock traders used to meet at a London coffeehouse, which they used as a marketplace (Bramble, 2016). The coffeehouse was later changed its name to "stock exchange" in 1773 that was the first exchange, the London Stock Exchange (Bramble, 2016). The concept was also exported to American colonies where an exchange started in Philadelphia in 1790 (Bramble, 2016). The merchants of Venice were credited with trading government securities as early as the thirteenth century (Ali, 2016). Soon after, bankers in the nearby Italian cities

of Pisa, Verona, Genoa, and Florence also began trading government securities (Ali, 2016).

1.3 Banking

Banks are the fulcrum of financial development in developing and emerging economies. Most of these countries rely on their banking sectors rather than financial markets (Adnan, 2011). Germany and Japan are classified as bank-based financial systems, while the United States and United Kingdom are market-based systems (Levine, 2002). The banking sector plays an important role in intermediation in the economy, such as receiving money from the public in the form of deposits and using such funds, in whole or in part, to grant loans and other credit facilities (Bettin & Zazzaro, 2009). Emerging markets confront more constraints than developed economies in terms of capital mobilization and accumulation (Bosworth et al., 1999). Furthermore, their capital markets are not well-developed; their most important source of capital derives from the banking sector. Money transferred through the banking system enables the recipient to gain access to banking products and services, thereby increasing demand for financial services. Remittances transferred through the banking system increase aggregate bank deposits, and this in turn affects credit intermediated by the banking sector. Tarus (2015) argue that foreign capital flows from remittances to the economy might increase banks' loanable funds. Recipients of remittances that do not pass through the banking system are also likely to demand banking services for safe custody (Aggarwal et al., 2011), thereby increasing the level of banking activity.

1.4 Stock Market

The analysis of stock markets is crucial for the development and design of investment strategies (Tabak et al., 2010). Stock markets enable firms to raise capital from the public, and this spurs the growth of firms and the economy. Well-developed stock markets provide liquidity, diversification, information, resource mobilization for corporate finance, investment, and growth (Bokpin, 2010). Countries with well-developed financial sectors have well-developed stock markets. While financial systems in developed economies are frequently dominated by stock markets, this is not the case in most emerging markets where they are less developed, may be inefficient, and often suffer weak corporate governance. Underdevelopment of capital markets limits risk-pooling and risk-sharing opportunities for both households and firms (Herring & Chatusripitak, 2007). The size of the stock market can be measured by using the ratio of "stock market capitalization as percentage of GDP" (Adnan, 2011).

2 Financial Development

A financial system needs to be resilient to systemic shocks, facilitate efficient financial intermediation, and mitigate the macroeconomic costs of disruptions in such a way that confidence is maintained in the system. There is a growing body of evidence that the development of a country's financial sector greatly facilitates its growth (Rajan & Zingales, 2003). Financial development is considered by many economists to be of paramount importance for output growth (Christopoulos & Tsionas, 2004). Using a variety of methodologies and data sets in different countries, research has shown that improved financial development is associated with growth (Greenwood et al., 2013; Hassan et al., 2011; Khan, 2001; Zhang et al., 2012). One of the reasons is that the financial sector serves to distribute funds from those with surplus capital and who need investment opportunities to those with a deficit of funds (Fisman & Love, 2003). Therefore, an economy with a well-developed financial sector will be able to allocate resources to businesses and projects that yield the highest returns. A well-developed and robust financial system is a key factor in maintaining financial stability in an economy given that it reduces the risk in the real economy (Sehrawat et al., 2016).

Financial development refers to a country's capability to efficiently and effectively channel savings into investment within its own borders (Kar et al., 2011). Hartmann et al. (2007) define financial sector development as the process of financial innovation, as well as institutional and organizational improvements in a financial system, which reduce asymmetric information, increase the completeness of markets, increase possibilities for agents to engage in financial transactions through (explicit or implicit) contracts, reduce transaction costs, and increase competition. As a financial market develops, it becomes less costly for firms to raise finance, thus increasing the number of projects that can be accepted when a firm makes an investment appraisal.

A well-developed stock market should theoretically increase savings and efficiently allocate capital to productive investments that eventually increase the levels of economic growth (Joseph McCarthy et al., 2015). A well-functioning stock market results in a more globalized economy, and increasing aggregate investment can potentially foster economic growth in emerging economies (Joseph McCarthy et al., 2015). The underdevelopment of capital markets in an economy limits risk-pooling and risk-sharing opportunities for both households and firms (Herring & Chatusripitak, 2007). Firms should rely on financial markets for information about which investment projects to select and how such projects should be financed. Financial development also increases investment through allocating capital to the private sector (Akinboade & Kinfack, 2015). Access to finance is crucial for companies. The second leading constraint on doing business after taxes and regulation is finance (World Bank, 2000). Finance is the most important constraint on firm growth; with greater access to finance, firms can grow faster (Akinboade & Kinfack, 2015).

Financial sector development reduces information asymmetry and price risk and is crucial for economic growth (Murinde, 2012). The banking sector generates revenue from mortgages and loans which is dependent on economic variables such as interest rates. Banks' roles are important in every country's economy as they are the key providers of credit to businesses, particularly in emerging economies. Stock markets and banks are clearly substitute sources for corporate finance because when a firm issues new equity, its need to borrow from banks declines (Arestis et al., 2001). Stock markets are a very critical sector of an economy as they provide a platform for buyers and sellers to meet up and trade. Chinn and Ito (2006) found that development in the banking sector is a precondition for equity market development and that developments in these two types of financial markets have synergistic effects. When the economy is stable and growing, the financial sector benefits from additional investment as growth leads to more capital projects and increased personal investment.

Banking concentration can be defined as a decrease in the number of banks in the industry linked to an increase in their average size or in simple terms, fewer banks of bigger size (Boyd & Graham, 1991). Hake (2012) empirically examined the impact of banking sector concentration on corporate debt and found that concentration has a positive effect on corporate debt, implying that higher banking concentration increases corporate debt. According to Baert and Vander Vennet (2009), increased banking concentration associated with information advantage may result in more relations with firms; thus, there will be higher lending and an increased level of firm leverage. Higher banking market concentration is associated with increased access to credit and is beneficial to firms' investment and growth (Abadi et al., 2016).

Economies like China and other emerging economies require well-developed financial systems, particularly financial intermediation and a liberalized interest rate, all of which are important for the efficient allocation of credit, which, in turn, can help to maintain sustainable, high levels of economic growth (Liang & Jian-Zhou, 2006). Sound economic conditions usually lead to more capital projects which result in increased corporate borrowing. Corporate finance theory suggests that market imperfections such as an underdeveloped financial system may constrain firms' ability to fund investment (Bokpin, 2010). According to Bettin and Zazzaro (2009), one channel through which the economy grows is the development of financial sector.

2.1 Institutional Environment

Developing countries are characterized by absent and/or weak institutional arrangements and market imperfections (Soundararajan & Brammer, 2018). The institutional environment of a developed financial system involves policies, regulations, laws, and supervision (Adnan, 2011). The business environment impacts the

financial system in terms of the availability of skilled workers, physical and technological infrastructure, and the cost of doing business (Adnan, 2011). Marquis and Raynard (2015) reviewed institutional strategies in emerging market contexts and found settings that are characterized by weak capital market and regulatory infrastructures and fast-paced turbulent change. A sound legal environment and protection of minority shareholders and bondholders could foster the financial development. Contract enforcement is considered as one of the most important elements of the rule of law in any country, because it provides protection to both parties (Adnan, 2011).

The institutional environment of a developed financial system involves policies, regulations, laws, and supervision (Adnan, 2011). Financial development is shaped by a country's legal environment. A sound legal system entails the formulation and implementation of robust financial policies and a regulatory framework. The legal system is the primary determinant of financial development and hence long-run growth (Levine, 2002). Institutional quality and government size impede financial development, whereas urbanization, industrialization, and service sector growth help in financial development in India and China (Shahbaz et al., 2018).

Legal environments differ across countries, and these differences matter for financial markets. Emerging economies with weak institutions are suffering from low financial and economic growth (Khan et al., 2020). Trade openness and institutions that constrain the political elite from unduly influencing financiers tend to promote financial development (Herger et al., 2008). Emerging markets have different institutional environments, financial access, and inclusion and therefore different levels of financial development.

2.2 Financial Access

Well-functioning financial systems allocate capital based more on the expected quality of the project and entrepreneur and less on the latter's accumulated wealth and social connections (Čihák et al., 2013). Efficient financial systems that overcome market frictions will more effectively identify and fund the most promising firms and not simply channel credit to large companies and rich individuals. Measures of market concentration are used to approximate access to stock and bond markets, based on the notion that a higher degree of concentration reflects greater access. Financial depth and financial stability are the best channels of reducing inequality (Tchamyou, 2021). The persistence of inequality in Africa requires policy makers to address income inequality by means of financial access. If access to finance through financial inclusion is achieved, it can help to fight poverty (Mhlanga, 2021). Africa has vast rural areas isolated from urban centres because of distance and poor road infrastructure and lack of Internet services, for instance, compound challenges associated with financial access.

2.3 Financial Crisis

Financial crises are characterized by the sharp contraction of the bank lending (Love, 2013). When financial firms are undercapitalized, they are vulnerable to external shocks, to reduce the risk they reduce leverage (Engle & Ruan, 2019). The global financial markets have become highly integrated. There is a global externality whereby the risk of a crisis in one country is strongly influenced by the undercapitalization of the rest of the world (Engle & Ruan, 2019). The global financial crisis of 2008 had a negative impact on growth mainly on those industries more reliant on external finance (Moore & Mirzaei, 2016). During global pandemic such as the coronavirus (COVID-19), investors panic, so they may unwisely sell their assets leading to a financial crisis where asset prices are declining (Chang et al., 2020). COVID-19 stopped the economic circle throughout the world because of restrictions imposed by countries, and this resulted in shocks in those markets. The health crisis of COVID-19 produced the financial crisis (Shehzad et al., 2020).

Blockchain also creates new intermediaries and secure payment systems; however, it also poses challenges. Blockchain technology emerged as a response to the Financial Crisis of 2007–2008; the perception was that banks had misbehaved resulting in a deterioration of trust in the traditional financial sector (Gudgeon et al., 2020). Cryptocurrency and blockchain has also its risks and challenges of disrupting financial development it is meant to foster; regulation of exchanges and challenges with transacting using the currency are some of the hurdles.

3 Conclusion

This book addresses key issues in financial development and financial stability in emerging markets. Countries in Asia, North Africa, and sub-Saharan Africa are susceptible to rapidly changing financial sectors and financial upheavals. The global financial crisis reflects the growing interdependence of states and capital markets. Poverty and income inequality, financial innovation, and financial inclusion because of a relatively large unbanked population in Africa are some of the issues of financial development of particular importance in this region. Foreign direct investment (FDI) and remittances are some of the critical contributors of financial development in the global south.

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Entrepreneurs' Dynamic Capabilities, Financial Resource Development and Financial Performance Among Small and Medium Enterprises in Emerging Markets: Experience from Tanzania

Ismail J. Ismail

Abstract Small and medium enterprises (SMEs) are the driving force behind the transformation of a developing economy into an emerging economy. However, for this to happen, SMEs must have owner-managers with dynamic capabilities that can help them acquire, plan and develop financial resources to achieve high financial performance. Previous studies have identified the existing gap on the link between dynamic capabilities and financial performances, particularly when mediated by financial resource development. This current study aims at studying the mediating role of financial resource development on the relationship between dynamic entrepreneurial capabilities and the financial performance of SMEs. The study used a cross-sectional design. The structured questionnaire was applied to collect data from 363 owner-managers, with a snowball sampling strategy cast-off to achieve the study's objective. The findings revealed that the dynamic capabilities (sensing, seizing, learning and transforming) significantly correlate with financial resource development. Also, the findings indicate that financial resource development significantly influences SMEs' financial performance. The study indicates further that financial resource development is significantly linked to financial performance, indicating a partial mediator. The study results imply that policymakers and implementers can use the findings to create relevant policy measures to enhance dynamic entrepreneurial capabilities and financial resource accessibility to impact SMEs' financial performance positively.

Keywords Dynamic capabilities · Sensing · Seizing · Learning · Transforming · Financial performance · Financial resource development

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1 Introduction

The worst global financial crisis since the Great Depression of the 1930s has resulted not only in the closure of numerous SMEs but has also in financial difficulties and the loss of thousands of jobs. The crisis has had a particularly negative impact on global demand and the development of financial resources. As a result, SMEs face structural challenges such as a limited ability to adapt to changing market conditions, a lack of business diversification, weak financial structure, low levels of capitalization and the reliance on external financing as a result of their limited capabilities to survive in chaotic market conditions (Karadag, 2016). Even though the global financial crisis has caused serious problems for SMEs, there is a clear indication that SMEs can become an important source of dynamism, innovation, job creation and an engine of poverty reduction, owing to their large share of the total enterprises. However, achieving these objectives requires proper initiatives such as management and development of available resources, a compositional blend of imitation and innovation, interpersonal processes and financial inclusions among SMEs (Akume & Iguisi, 2020; Sun et al., 2021).

Thus, SMEs must build capabilities to compete in the emerging markets (Sun et al., 2021). Dynamic capabilities-based views include social constructionist schools positioned to be an advanced level of strategies to renovate competencies to achieve new and improved forms of competitive and reasonable advantages in business aspects. Compared to those strategies presented in evolutionary behavioural school (competency-based view) and rational equilibrium school (resource-based view), strategic management research and development based on today's fast-paced business environments, idiosyncratic and core skills have become increasingly important. This is because competitive advantage and SMEs success are determined not only by the firm's tangible assets but also by the firm's ability to adapt and change (Navarro, 2019). Thus, the process of integrating, developing and reconfiguring internal and external competencies is centred on the ability to respond to and shape rapidly the changing business environments to adapt to new market conditions and achieve evolutionary fitness (Ferreira et al., 2021; Fitriati et al., 2020; Teece, 2007).

Studies on dynamic capabilities have primarily focused on industrialized markets; comparatively, there is little empirical evidence from the emerging markets (Khan et al., 2020). A similar observation is made by other scholars (i.e. Ambrosini & Bowman, 2009; Teece, 2012), who also emphasized that most dynamic capabilities are assumed and very few empirical findings exist in the emerging economies. In addition, the emerging markets have their own institutional and legal settings, which means that theories developed in the western world may not be universally relevant to these economies if the context in which these enterprises emerge and later function are not taken into account (Akhtar et al., 2020). Moreover, even in the relatively few examples where studies have been conducted in the emerging markets, the emphasis has been on the direct linkages between capabilities and performance, with less emphasis on the financial performance indicators of SMEs in those

markets (Dominic & Theuvsen, 2015). The absence of empirical evidence on the indirect links has created an obvious knowledge gap in understanding SMEs' financial performance.

As a result of their transition from the "developing" to the "developed" phase, the emerging markets have experienced significant economic progress and incorporated some, but not all, of the characteristics of a developed economy (Dinh et al., 2013). In most cases, this transformation needed high planned dynamic capabilities among the SME entrepreneurs because in responding to market changes and technological advancements, SMEs must react quickly and accurately. This is especially true in today's increasingly volatile, uncertain, complicated and ambiguous business environments. Also, SMEs must respond quickly and accurately to market the change of conditions or to the introduction of new technology. Dynamic capabilities provide the basis for processes and procedures that allow businesses to adapt and evolve in response to changing situations.

However, regardless of its growing recognition, dynamic capabilities have faced criticism because of ambiguity and contradictions in its literature. This is evidenced by the mixed results of studies that have analysed the effect of dynamic capabilities on the performance of small firms (Boehlje et al., 2011; Dominic & Theuvsen, 2015; Huber et al., 2014; Mukhobe, 2015). As a result, there have been increasing calls to provide empirically collaborated insights to ascertain the potentials of dynamic capabilities on the firms' performance by using other variables that can be used as mediators in solving the ambiguous results. As noted by previous studies (i.e. Adomako & Danso, 2014; Ngek, 2016), having adequate financial knowledge as one of the elements of dynamic capability may not certainly transform SMEs into high-performing enterprises without financial resource development as a critical component of every organization's operations.

Operating power and expansion potential of any companies are jeopardized if the companies do not have adequate access to finance. This means financial resource development may be an important mediating variable between dynamic capabilities and the financial performance of SMEs. In addition, financial resources are important and challenging resources among SMEs in the emerging economies. They are an important resource because they help the functioning of the SMEs' daily cash flow activities and continuous transactions. Availability of finance also assists in organizing SME management operations such as payments related to bills and investment in multiple engagements of the inflow and outflow of money within the SMEs.

However, in many emerging markets, financial resource development, especially credit accessibility, has been a major concern because the emerging markets are characterized by the informality of the business sector, which has low-income sources. The most important funding source for SMEs is internal financing, which is insufficient for SMEs' development and financial viability. Access to external loans is crucial for SMEs to handle their cash flow challenges and expand their business operations, including creating new products (Balogun et al., 2016). Although the literature has not directly linked dynamic capability and financial resource development, financial resources, such as any other resources, can be effectively managed through a proper set of dynamic capabilities, which comprise

the following major processes related to financial resource development: sensing, learning, seizing and transformative capabilities. Scholars (i.e. Akenroye et al., 2020; Ambrosini & Bowman, 2009) propose these capabilities because of their direct effects on SMEs' success areas.

According to Pavlou and El Sawy (2011), sensing capability entails identifying, developing and assessing any environmental opportunities related to customer and firm needs. Sensing provides the continuous ability to scan the organizational environment that entails the identification of new advancements and business prospects. Businesses with high sensing capacity are recognized for their ability to obtain strategically relevant information from their surroundings reliably, such as market trends; best practices activities of competitors, new technological and financial opportunities and new ideas and market opportunities (Cyfert & Krzakiewicz, 2016; Ng & Al-Shaghroud, 2018; Osakwe et al., 2016; Pavlou & El Sawy, 2011). The major difference between sensing and seizing is that sensing is mostly considered during the "identifying opportunities" stage, while seizing is based on "developing the identified opportunities". In other words, the act of seizing capabilities prompts the development of new products or services to assist in the exploration of perceived sensed opportunities (Kump et al., 2019). Therefore, the identified and acquired financial resources from financial institutions are supposed to be developed in an intended manner to achieve the goal.

On the other hand, the importance of learning capabilities involves acquiring, assimilating and transforming new knowledge and experiences to strategically maximize the firm resources (Gancarczyk & Zabala-Iturriagagoitia, 2015). The integration in the learning process brings together the firm's resources, resulting in the arrangement and creation of new resources (Rotjanakorn et al., 2020). In addition, transformative capabilities are related to strategic focus and strategic competencies on resource management. These skills aid businesses in generating unique market positioning and identifying how to change to keep that position over time. After successfully sensing, seizing and learning procedures, the acquired opportunities and resources must be transformed into effective ways for SMEs to perform (Kump et al., 2019). According to Onyinyi and Kaberuka (2019), transformative capabilities include the attempts of changing the products, processes and markets in response to customer expectations. Transformation capabilities also include establishing business relationships with long-term stakeholders to improve corporate performance. Compared to other dynamic capabilities, this one stands out as a one-of-a-kind capability that ensures strong competitiveness in the ever-changing environments. This study is therefore aimed at providing empirical evidence on the relationship between entrepreneurs' dynamic capabilities and financial performance among SMEs for the emerging markets when mediated by financial resource development.

2 Theoretical Perspectives

The most often asked questions in the literature are how SMEs might achieve higher performances and what can be done to make these SMEs continue to exist. To answer these questions, this study combines four major theories: resource-based theory (RBT), competency-based theory (CBT), dynamic capability theory (DCT) and access to capital theory (ACT). These four theories are used because this study used three main factors, dynamic entrepreneurial capabilities, financial resource development and financial performance. The connection of these three factors requires these four theories. For example, the RBT concludes that the availability of superior resources can exacerbate the differences in performance between firms (Barney, 1991; Penrose, 1959). This implies that every type of resource, including physical, human and financial resources, can be used to ensure the firm's performance. Indeed, financial resources must be available for SMEs to access (Rahim & Bakar, 2014).

On the other hand, CBT argues that while resources are important, competencies are critical for achieving high performance (Freiling, 2004). As a result, resources must be carefully considered, appropriately assigned and utilized to achieve the desired outcomes with minimal effort. Also, DCT was adopted to describe how SMEs might deploy resources and capabilities to acquire competitive advantages in a rapidly changing environment (Teece et al., 1997). Additionally, ACT recognizes that entrepreneurs' lack of understanding of the various financial services offered by various financial institutions results in knowledge gaps (Michello & Wanorie, 2015). Therefore, for SMEs to access the available financial resources and use them for future financial independence, they must develop a mechanism that will eliminate information gaps.

3 Literature Review and Hypothesis Development

Although there is a dearth of literature connecting dynamic capabilities, financial resource development and SMEs financial performance, the available literature has posted key challenges of dynamic capabilities, which suggest the need for other studies to relate the concepts of dynamic capabilities to other theoretical and empirical constructs (Ferreira et al., 2021; Fitriati et al., 2020; Omeke et al., 2021). Therefore, in the most reviewed literature, resources have been given high priority in explaining the crucial role of dynamic capabilities.

3.1 Sensing Capability and Financial Resource Development

Firms must examine and explore both their internal and external environments to find potential opportunities for growth (Breznik et al., 2019). Many past studies have noted positive associations between sensing capability and business growth. However, few studies have connected sensing capabilities with the firms' financial resource development. According to Teece (2007), a firm's ability to filter, shape and calibrate opportunities as they arise is critical for converting the firm's resources into the firm's performance. This shows how a business identifies, interprets and pursues environmental opportunities (Pavlou & El Sawy, 2011). According to studies (i.e. Ng & Al-Shaghroud, 2018; Osakwe et al., 2016), sensing operations include the identification and recognition of new technological, financial, market and mounting opportunities as well as the development of mounting solutions that are suited to the firm's intended market. As a result, every novel and innovative strategy, such as the acquisition of financial resources, is contingent on the effectiveness of the sensing process (Abro et al., 2011). It is, therefore, reasonable to hypothesize that.

H1: Sensing capability significantly relates to financial resource development.

3.2 Seizing Capability and Financial Resource Development

The need to respond to opportunities as soon as they are identified must be addressed by developing new products, services and processes (Breznik et al., 2019; Kump et al., 2019). The second most significant set of dynamic capabilities after sensing is the ability to seize. Seizing capability is related to developing the prospects that have been identified during the sensing stage. Managers and owners can transform opportunities into resourceful assets that can aid SMEs in improving their performance. Seizing, according to Akenroye et al. (2020), enables SMEs in developing innovative offerings, exploit identified opportunities, develop new products/services and make better use of resources by collaborating with other businesses and organizations. As noted by Ferreira et al. (2021), seizing enhances awareness of accessible resources, knowledge and skills. Similarly, Kump et al. (2019) state seizing connects external and internal information and knowledge, and which is intimately associated with strategic decision-making financial investment decisions, particularly for SME's performance. To this end, it is prudent to hypothesize that.

H2: Seizing capability significantly relates to financial resource development.

3.3 Learning Capability and Financial Resource Development

Financial resources are scarce, and therefore they need a proper strategy to be effectively managed. Learning capabilities offer chances for improving financial resources and management and increasing organizations' financial performances. Literature (i.e. Jerez-Gómez et al., 2019) has shown that the adoption of learning capabilities enhances organizational effectiveness; practical implications from the previous studies have shown that individuals' learning capabilities assist managers and employees in gaining new experiences, becoming innovative and training their brains to deal with a wide range of obstacles to have competitive advantages. Scholars (Wan Hooi & Sing Ngui, 2014) noted a direct link between learning capabilities and financial performance by insisting that employees' learning capability supplies skills, motivation, information and latitude, which affect their discretionary behaviour and the organization's performance. In addition, the integration in the learning process brings together the firm's assets and resources, resulting in the arrangement and creation of new resources such as financial resources (Rotjanakorn et al., 2020). Therefore, the study hypothesized that.

H3: Learning capability significantly relates to financial resource development.

3.4 Transforming Capability and Financial Resource Development

There may be no visible changes in the organization if the new information and ideas discovered via sensing and developed through seizing and learning capabilities remain in the realm of theory (Kump et al., 2019). Transforming capabilities assist SMEs in converting their decisions about new products or innovative processes into more practical forms by putting in place the necessary structures and routines through the use of seized and learning strategies and by implementing the necessary structures and routines. According to Teece (2007), organizational transformation is critical because it enables real-time implementation of strategies by reorganizing its resources and organizational structures and procedures. Teece (2007) characterizes transforming as the reconfiguring process and organizational structures to accommodate the firm's growth and changes in the markets and technologies. On the other hand, Li and Liu (2014) advocate that depending on the nature of the aim, transforming capabilities are essential for implementing and coordinating strategic decisions and corporate transformation based on the available managerial and organizational procedures. In the light of transforming capabilities that have been identified, it was hypothesized.

H4: Transforming capability significantly relates to financial resource development.

3.5 Financial Resource Development and Financial Performance

For this study, financial resource development is considered as the process of financial acquisition, maintenance and advancement. According to Rahim and Bakar (2014), the financial acquisition is another part of a person's human capital that may be beneficial in discovering and exploiting possibilities of improving SMEs' performance. Similarly, scholars (Muneer et al., 2017) propose that financial management methods have a substantial impact on the financial performance of SMEs. As a result, SMEs which routinely and frequently prepare their financial statements, balance sheets and income statements as part of financial development strategies may maintain their financial status and hence be able to advance financially and achieve financial performance effectively. In addition, as Ombongi and Long (2018) observe, the acquisition of credit by SMEs has remained a major challenge for many SMEs who cannot qualify for credit funding. Those that have accessed credit, on the other hand, have demonstrated that credit accessibility and appropriate credit management have a favourable impact on the overall performance of SMEs. That is to say, those who have financial resource development skills can effectively use finance to significantly increase SMEs performance. As a generalized statement, entrepreneurial marketing is fuelled by entrepreneurial opportunities, which entails the identification, maintenance and developing financial opportunities for producing highly competitive products for profitable customers by employing inventive methods to resource leveraging and value creation. It is therefore consequently hypothesized.

H5: Financial resource development significantly relates to financial performance.

4 Research Methods

The study used a cross-sectional design and was carried out in Dar-es-Salaam and Dodoma cities in Tanzania. The cities were selected because Dar-es-Salaam is Tanzania's largest commercial city, with a mushroom of existing and newly established SMEs, and Dodoma is Tanzania's capital city, located in the heart of the country, making it the fastest-growing city connecting all of Tanzania's regions. As a result, these cities have a considerable number of SMEs.

4.1 Sample Size and Sampling Procedures

A sample survey was used for the research design. In contrast, convenience and snowball sampling procedures were used in sample selection because Tanzania

Revenue Authority registers only owners with a tax identification number. Hence there was no sampling frame for owner-managers. Nevertheless, owner-managers were selected for the study because owner-managers possess rich information pertinent to the investigation. Furthermore, the study included only SMEs that had been in operation for at least 5 years for researchers to collect enough data to examine dynamic capacities, financial resource development and financial performance.

Furthermore, given the nature of SMEs in developing nations, obtaining a valid sampling frame of SMEs could have been a problem. In particular, exponential discriminative snowball sampling was used, in which each owner-manager was asked to provide some references. However, the first group of owner-managers was sufficiently diverse to ensure sample variety, which requires meaningful research findings. Therefore, the sample size was calculated using the infinity formula previously used by Mashenene and Kumburu (2020).

$$n = z^2.pq/d^2 \tag{1}$$

where "n" means sample size, "Z" standard variate = 1.96 for a 95% level of confidence, "p" the proportion of the largest population = 50%, "q" = 1−p and "d" the degree of accuracy at 0.05. Thus, $n = (1.96)^2 \times (0.5 \times 0.5)/ (0.05)^2 = 384$. However, during data collection only 363 questionnaires were returned implying that the response rate was 94.53%.

4.2 Data Analysis

This study used structural equation modelling (SEM) to analyse the influence of dynamic capabilities on financial resource development and the influence of financial resource development on the financial performance of SMEs. Confirmatory factor analysis (CFA) and path analysis were conducted through SEM. SEM is considered a multivariate technique that integrates observed (measuring) and unobserved variables (latent) in statistical analysis. In contrast, other classical linear regression modelling methods measured the observed variables. SEM, in particular, aims to represent the interactions between several variables by employing a sequence of equations, as described by Kline (2011). It combines the simultaneous performance of many multivariate approaches, such as factor analysis and regression analysis, to produce a more comprehensive result. On the other hand, the SOBEL test was used to test the mediation effect of the financial resource development whose four criteria developed by Baron and Kenny (1986) were considered: 1. the relationship between independent and dependent variables must be significant, 2. the relationship between independent and mediator variables must be significant, 3. the relationship between the mediator and dependent variables must be significant, and 4. finally, the relationship between independent and dependent variables after

controlling the effect of the mediator variable must no longer be significant. This indicates a full mediation, if it is still significant, but if it substantially reduced, then it indicates partial mediation.

4.3 Measurement of Variables

This proposed study consisted of three factors. First, the dynamic capability is presented as the independent variable, the financial performance is the dependent variable, and the financial resource development is regarded as the mediating variable. This study selected survey items from previous studies with suitable adjustments in some mandatory areas. The study measures the dynamic capability (DYC) using four constructs, sensing capability (SEN) with three measurement items (SEN1-SEN3), seizing capability (SEI) with three items (SEZ1-SEZ3), learning capability (LEA) with three items (LEA1-LEA3) and transforming capability (TRA) with three items (TRA1-TRA3). These items were adopted and modified by scholars (i.e. Akenroye et al., 2020; Jerez-Gómez et al., 2005; Kump et al., 2019; Pavlou & El Sawy, 2011; Teece, 2014). Another construct is financial resource development (FRD), which consists of three items (FRD1-FRD3). These items were adopted and modified by these scholars (i.e. Cole et al., 2009; Ngek, 2016; Van Auken, 2013). The study also measured financial performance (FIN) using five items (FIN1-FIN5). The items were adopted and adjusted from Hindasah and Nuryakin (2020). Finally, data were captured by using a 5-point Likert scale. All the items used are presented in Table 2.

4.4 Descriptive Analysis

This section highlights owner-manager demographic characteristics and central tendency analysis.

Demographic Characteristics

The results in Table 1 reveal that 332 (91.5%) SMEs operated between 5 and 16 years while 31 (8.5%) were above 17 years in operation. This means that all SMEs existed for at least 5 years in the operation, and hence they had enough dynamic capabilities to handle challenges from the external environments, including financial resources challenges. Moreover, 321 (88.2%) of most owner-managers were aged between 23 and 46 years, while 42 (11.8%) were 47 years and above. Additionally, 28 (7.7%), 209 (57.6%) and 126 (34.7%) had primary, secondary and college levels of education, respectively. On the other hand, the majority, 300 (82.6%), had the managerial experience of below 21 years, while 63 (17.4%) had the experience of above 22 years. These findings indicate that most owner-managers are young and educated; therefore, they had dynamic capabilities

Table 1 Demographic characteristics

Items	Frequency	Percentage (%)
SMEs years operations		
5–8 years	163	44.9
9–12 years	106	29.2
13–16 years	63	17.4
More than 17 years	31	8.5
Total	***363***	***100***
Age of the owner-manager		
23–28	9	2.4
29–34	41	11.2
35–40	254	69.9
41–46	17	4.7
47 and above	42	11.8
Total	***363***	***100***
Level of education		
Primary level	28	7.7
Secondary level	209	57.6
Collage level	126	34.7
Total	***363***	***100***
Owner-manager experience		
5–10	260	71.6
11–21	40	11
22 and above	63	17.4
Total	***363***	***100***

Source: Survey data, 2021

and were willing to make innovative decisions to seek and develop financial resources.

4.5 Measurement of Central Tendencies

This section presents the central tendencies, mean and standard deviation findings for all questionnaires addressed to 363 owner-managers. The findings in Table 2 indicate that the highest mean and standard deviation (SD) for all measurement items are 4.7536 and 0.7203, respectively. And the lowest mean and SD are 2.3242 and 0.1233, respectively. The ranges between 2.3242 and 4.5123 depict positive responses among owner-managers and that their responses move from disagreement to agreement for almost all measuring items.

Table 2 Central tendencies

Construct	Items	Mean	Standard deviation (SD)
SEN	SEN1: Ability to scan for and identify opportunities	2.9867	0.4321
	SEN2: Ability to gather and evaluate market information	3.4563	0.3215
	SEN3: Ability to identify opportunities and assess customer needs	2.3651	0.1233***
SEI	SEI1: Ability to develop innovative offerings	4.2354	0.6121
	SEI2: Ability to exploit sensed opportunities	2.4322	0.2141
	SEI3: Ability to develop new products by making better use of resources	4.1218	0.2135
LEA	LEA1: Ability to demonstrate a strong commitment to learning	3.2344	0.5232
	LEA2: Ability to transfer knowledge and teamwork and problem-solving	4.2313	0.3421
	LEA3: Ability to continuously innovate and integrate external knowledge	2.3242***	0.7203***
TRA	TRA1: By defining clear responsibilities, we successfully implement plans	4.3234	0.3252
	TRA2: In our company, change projects can be put into practice	4.3525	0.3164
	TRA3: We have demonstrated our strengths in implementing changes	4.7536***	0.7001
FRD	FRD1: We have sufficient access to finances for our financial development	4.5123	0.5439
	FRD2: We have enough financial literacy for financial development	4.6541	0.3216
	FRD3: We can use financial statements for development decisions	4.3474	0.4326
FIN	FIN1: The profit of the company has increased in the last 3 years	4.1129	0.6397
	FIN2: Assets of our SMEs have increased in the last 3 years	4.2312	0.5393
	FIN3: Working capital in our SMEs have increased in the last 3 years	4.1024	0.5482
	FIN4: The number of sales growths has increased in the last 3 years	4.2317	0.1928
	FIN5: The cash flow has increased in the last 3 years	4.3271	0.3948

Source: Survey data, 2021
*** denotes low and high mean and standard deviations

4.6 Confirmatory Factor Analysis (CFA)

The values in Table 3 are all within the threshold, showing that the predicted model fits perfectly.

GFI (goodness fit index), AGFI (adjusted goodness fit index), NFI (normed fit index), IFI (increment fit index), TLI (Tucker-Lewis index), and CFI (comparative

Table 3 The Goodness of fit index for the structural model

The goodness of fit index	Recommended value	Actual value	Comment
GFI	Close to 1	0.911	Good
AGFI	Close to 1	0.915	Good
NFI	Close to 1	0.932	Good
IFI	Close to 1	0.953	Good
TLI	Close to 1	0.917	Good
CFI	Close to 1	0.901	Good
x^2/df	$1 \leq x^2/df \leq 3$	2.793	Good
RMSEA	$0 \leq$ RMSEA ≤ 0.1	0.078	Good

Source: Survey data, 2021

fit index) should all be greater than 0.9, x^2/df should be greater than 3, and RMSEA should be less than 0.1(Hooper et al., 2008). As a result, the measuring items accurately represented dynamic capabilities, financial resource development and financial performance.

4.7 Model Validity and Reliability

Table 4 shows that all item loadings were greater than 0.5, indicating high convergent validity (Tabachnick & Fidell, 2012). Furthermore, all variables have a Cronbach's Alpha Coefficient > 0.7, implying that the study's constructs are internally consistent and reliable (Pallant, 2000; Tabachnick & Fidell, 2012). Additionally, all variables exhibit composite reliability (CR) > 0.6 and maximal reliability (MaxR (H) > 0.7, showing that the instruments were reliable. Furthermore, both variables have an average variance extracted (AVE) > 0.5, indicating that the data have convergent validity.

Likewise, discriminant validity was examined by comparing the value of the square root of AVE and correlations between variables and by comparing the value of AVE of each specific variable with its respective maximum shared variance (MSV). In addition, the value of AVE for a given variable should be greater than the variance, which it shares with another variable. As indicated in Table 5, the discriminant validity of the data was achieved because the square root of AVE was greater than the value of correlations between the variable and other variables and the value of each AVE is greater than their respective MSV (Fornell & Larcker, 1981).

5 Results and Discussion

The results in Table 6 and Fig. 1 show that SEN, SEI, LEA and TRA have a positive and significant impact on financial resource development (FRD). Additionally, FRD was also found to have a positive and significant relationship with financial

Table 4 Validity and reliability

Construct	Items	Cronbach's alpha	MaxR(H)	Item loadings	AVE	CR
SEN	SEN1	0.812	0.801	0.765	0.601	0.818
	SEN2			0.854		
	SEN3			0.699		
SEI	SEI1	0.799	0.801	0.627	0.593	0.811
	SEI2			0.873		
	SEI3			0.789		
LEA	LEA1	0.892	0.859	0.796	0.744	0.897
	LEA2			0.912		
	LEA3			0.875		
TRA	TRA1	0.901	0.896	0.987	0.769	0.908
	TRA2			0.752		
	TRA3			0.876		
FRD	FRD1	0.822	0.819	0.772	0.639	0.838
	FRD2			0.654		
	FRD3			0.945		
FIN	FIN1	0.874	0.852	0.675	0.603	0.882
	FIN2			0.775		
	FIN3			0.875		
	FIN4			0.876		
	FIN5			0.654		

Source: Survey data, 2021

Table 5 Discriminant validity

	CR	AVE	MSV	FRD	SEN	SEI	LEA	TRA	FIN
FRD	0.838	0.639	0.490	**0.799**					
SEN	0.818	0.601	0.490	0.700	**0.775**				
SEI	0.811	0.593	0.436	0.350	0.660	**0.770**			
LEA	0.897	0.744	0.372	0.540	0.530	0.610	**0.862**		
TRA	0.908	0.769	0.203	0.280	0.350	0.450	0.350	**0.877**	
FIN	0.882	0.603	0.212	0.420	0.460	0.410	0.450	0.340	**0.777**

Source: Survey data, 2021
Notes: Bolded values represent the square roots of AVE

Table 6 Regression output

Hypotheses	Variables	Estimate	S.E.	C.R.	P	Decision
H1	SEN → FRD	0.291	0.074	3.931	0.009	Supported
H2	SEI → FRD	0.233	0.062	3.756	0.014	Supported
H3	LEA → FRD	0.573	0.085	6.741	***	Supported
H4	TRA → FRD	0.272	0.071	3.831	0.007	Supported
H5	FRD → FIN	0.684	0.093	7.352	***	Supported

Notes: *** denotes $p < 0.001$

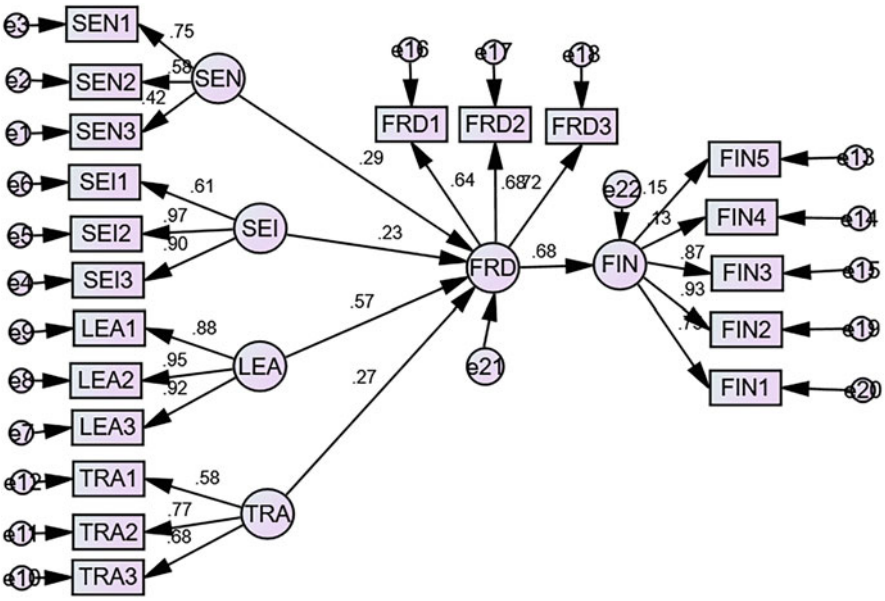

Fig. 1 Path diagram. Source: Survey data, 2021

performance. Hence all five hypotheses were supported. As a result, any effort to improve this dynamic capability (DYN) constructs will increase financial resource development for financial development.

The study's main objective was to empirically estimate the influence of entrepreneurs' dynamic capability on the financial performance among SMEs when mediated by financial resource development. The findings of this study in Table 6 and Fig. 1 validate that financial performance among SMEs increases significantly when owner-managers apply their dynamic capabilities to improve the development of financial resources. It was further validated that, for the SMEs to avoid financial dependence from the financial institutions, most SMEs have developed proper dynamic capabilities enough for developing financial resources.

5.1 Sensing Capability and Financial Resource Development

Specifically, the findings in Table 6 and Fig. 1 validated that sensing has ($\beta = 0.291$, $p < 0.05$). This means there is a possibility of improving financial resource development by 29.1% if sensing is increased by one unit. Hence *H1: Sensing capability significantly relates to financial resource development* was supported. This is because sensing capability was associated with helping SMEs increase levels of identifying and scanning financial opportunities from potential sources of finance that offer minimal collateral requirements, low-interest rates and long payment

periods. The findings concur with the findings in a study by Breznik et al. (2019), who revealed that sensing skills assist SMEs in identifying new technologies, new ideas and scanning for new markets/customers, resulting in increased organizational performance. Also Osakwe et al. (2016) stated, sensing capability contributes greatly to the profitability of SMEs; it was thus recommended that SMEs make some efforts of building sensing capability, given that this unique capability is critical to unlocking both current and future marketing possibilities. The odds of gaining and developing financial bases from external and internal sources may increase as the owner-managers understand how to gather and evaluate financial resource information through sensing capability development.

5.2 Seizing Capability and Financial Resource Development

In addition, seizing in Table 6 and Fig. 1 was validated to have ($\beta = 0.233$, $p < 0.05$) and hence associated with a 23.3% increase in financial resource development if increased by one unit. This means *H2: Seizing capability significantly relates to financial resource development* was supported. It was revealed that seizing provides mechanisms for proper implementation of innovative strategies, resulting in proper utilization of sensed finances for developing new competitive products by making better use of sensed financial resources. The findings are in line with the findings in a study by Kump et al. (2019), who proposed that seizing serves as a link between external and internal information and knowledge and is intimately associated with strategic decision-making, particularly in the context of investment decisions.

5.3 Learning Capability and Financial Resource Development

In addition, the learning capability was found to have ($\beta = 0.573$, $p < 0.05$), which means that owner-managers have enough commitment to learning and can transfer knowledge to the working teams and solve problems collectively. Hence *H3: Learning capability significantly relates to financial resource development* was supported. The study also validated that owner-managers of SMEs can continuously innovate and integrate external knowledge for improving daily financial activities. This means if improved by a unit, learning capability can increase the chances for developing financial resources by 57.3%. The findings are in line with the findings in a study by Hindasah and Nuryakin (2020), who revealed that the benefits obtained from learning capability are the highest in gaining and transferring knowledge within the organization. This is also supported by Cyfert and Krzakiewicz (2016), who stated that learning capabilities could have a good and considerable impact on an organization's financial success.

5.4 Transforming Capability and Financial Resource Development

Precisely, the findings found that transforming capability has ($\beta = 0.272$, $p < 0.05$). This proposes developing financial resources by 27.2% if improved by one unit. Thus *H4: Transforming capability significantly relates to financial resource development* was supported. Furthermore, these findings revealed that financial and other resources sensed and seized need to be transformed into other forms for the SMEs to achieve their goals. Besides, it was revealed that most owner-managers could clearly define and implement plans related to finance. The same was revealed by Kump et al. (2019), who showed that transforming capabilities improve, combine, safeguard and, when necessary, reconfigure a commercial enterprise's intangible and tangible assets, resulting in improved path dependency and performance.

5.5 Financial Resource Development and Financial Performance

Finally, the findings indicate a high chance of financial resource development influencing high financial performance. This is because financial resource development was found to have ($\beta = 0.684$, $p < 0.05$). Hence if SMEs improve finance resource development, financial performance may increase by 68.4%. Therefore, *H5: Financial resource development significantly relates to financial performance* was supported. The plausible explanation is that most owner-managers have proper plans for financial resource development, increasing sufficient access to finances, financial literacy for financial development and improving the uses of financial statements for development decisions. Thus, the findings match the findings in a study by Inmyxai and Takahashi (2010) that resources, as described by business finance, are essential for funding strategic resources and reorganizing or expanding a company to achieve financial performance.

5.6 Testing the Strength of Mediator

The SOBEL test was used to determine the strength of the mediator variable, and the findings were interpreted in the light of the parameters for evaluating simple mediation as proposed by Baron and Kenny (1986). The financial resource development (FRD) was found to be a partial mediator of the relationship between dynamic capability (DYN) and financial performance (FIN), as indicated in Table 7.

Table 7 SOBEL test output

Variables	Coeff	S.E	T	Sig (two)
DYN → FIN	0.9647	0.0575	16.7751	0.0000
DYN → FRD	0.5734	0.1342	4.2724	0.0000
FRD → FIN	0.4643	0.1435	3.2353	0.0000
DYN → FRD → FIN	0.2859	0.1243	2.3001	0.0022

0.0000 implies *p*-value is <0.001

6 Conclusion

While there are positive and significant chances that dynamic entrepreneurial capabilities such as sensing, seizing, learning and transforming can directly result in the high financial performance of SMEs, increasing the development of financial resources is a significant step in improving the financial performance of SMEs in the emerging market environments. In particular, it is plausible to conclude that sensing capability provides information processing capability that enables SMEs to seek out, create and maintain contact with outsiders. This enhances the possibility of SMEs strengthening their ability to grow financial resources.

On the other hand, it can be concluded that high levels of financial resource development result from sensing capabilities and SMEs' capacity to seize them. SMEs require particular skills and processes that can enhance priority investments due to the limited financial resources accessible to them. Furthermore, it was discovered that learning capability, defined as the strategic capability for business survival, leads to the development of financial resources. Through creating training programmes, SMEs can acquire and disseminate knowledge, facilitate teamwork and provide problem-solving information. This can help SMEs in their efforts to develop and integrate external financial knowledge into their operations continuously.

Furthermore, it may be argued that transforming capabilities are critical since they help maintain strategic competitive advantages when an opportunity is discovered. Moreover, the benefits of having transformative potential will not be limited if opportunities are capitalized on early in the transformation process. Finally, it was shown that a significant percentage of SMEs increase their financial performance due to their dynamic entrepreneurial capabilities and rely on the development of financial resources to continue to grow. As a result, the expansion of financial resources should be founded on sensing, seizing, learning and transforming capabilities.

6.1 Study Implications

This study provides information that policymakers and implementers may use to create relevant policy measures to enhance dynamic entrepreneurial capabilities and financial resource accessibility to impact SMEs' financial performance positively. For example, policy measures, such as training programmes, must be devised and

made available to SMEs' owners and managers to strengthen their ability to perceive, seize, learn and transform financial resources for the high financial performance of SMEs. In addition, the government and private sector must develop credit guarantee programmes to boost the availability of finance for SMEs.

On the other hand, the outcomes of this study demonstrate that more than one theory can be merged to explain the outcome variables. This study, in particular, successfully employed and confirmed the resource-based theory, competency-based theory, dynamic capacity theory and access to capital theory to investigate the financial performance of SMEs.

It also suggests that, while resource-based theory can be used to investigate the presence of resources such as finances, competency-based theory and access to capital theory provide competencies and methods for getting and successfully utilizing these resources. On the other hand, dynamic capability theory states that SMEs must be dynamic enough to alter the available resources in response to environmental shocks.

6.2 Limitations and Areas for Further Studies

Though the findings of this study contribute to the body of literature, the study had limitations that may serve as a stepping stone for future research. First, the study employed a cross-sectional design in which data were obtained just once at a time. Owner-managers may strengthen their dynamic capacities over time through training, hence increasing their financial resource development and financial performance abilities. As a result, a longitudinal design is required to identify dynamic capabilities and financial resource development variances among SMEs. Second, due to a lack of a sampling frame, the study employed snowball sampling; subsequent studies may use alternative sampling if a sample frame is available. Third, due to the lack of quantitative financial performance measures such as return on asset (ROA) and return on investment (ROI), the financial performance in this study was captured using Likert-scale measures. ROA and ROI may be used in future studies whenever these financial measures are accessible. Finally, this study took a quantitative approach by evaluating hypotheses that did not explore a naturalistic picture of the issue under study. Therefore, more research might be conducted to investigate the subject issue further using a qualitative or hybrid technique.

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Does ICT Diffusion Drive the Finance-Growth Nexus? Evidence from Sub-Saharan Africa

Taiwo Owoeye, Omowumi O. Idowu, and Akindele J. Ogunsola

Abstract Technological innovation has become a major channel through which financial development drives economic growth, and the chapter attempted to provide evidence for this, using data for sub-Saharan Africa (SSA). For its theoretical foundation, the study extended the endogenous growth theory by incorporating information and communication technology (ICT) diffusion as a possible catalyst causing financial development to affect economic growth based on the supply-leading and demand-following hypotheses. Following existing literature, the study constructed an ICT diffusion index, using principal component analysis (PCA) and a dataset representing mobile phone subscribers per 100 people, fixed telephone line subscriber per 100 people and broadband Internet subscribers per 100 people. The study used the growth rate of GDP as the dependent variable, while financial development and economic openness were the independent variables. The study adopted the pooled mean group estimator of the autoregressive distributed lag (ARDL) model to analyse the data, which covered the period 2000 to 2020. The results showed that in the long run, while the ICT index drove growth, the interaction of financial development with the ICT index was significantly negative for growth in SSA. Therefore, this result did not support the supply-leading hypothesis. A tenable reason for this finding could be the inability of private credit to drive output expansion and the challenge of financial inclusion in Africa. Therefore, this study led to the recommendation that countries in SSA should channel private credit to value-added activities and increase financial inclusion so that innovation can drive economic growth through financial development.

Keywords ICT · Diffusion · Finance-growth nexus · Sub-Saharan Africa

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1 Introduction

The role of finance as a major driver of economic growth has been well discussed in the literature, and the foundation for this debate has been the McKinnon-Shaw hypothesis, which brought into focus the importance of financial development for long-run economic growth (Mckinnon, 1973; Shaw, 1973). The initial channel for the finance-growth nexus was capital accumulation through rapid expansion in the financial service sectors of the economy facilitating economic growth (Goldsmith, 1969). Rapid expansion in financial services through the mobilisation of deposits, gathering of portfolio information resource allocation and fostering risk reduction have been identified as enablers of long-run economic growth (Abu-Bader & Abu-Qarn, 2008). However, in recent times, there has been growing interest in how financial development drives economic growth through technological innovation (Adu et al., 2013).

This strand of the literature has incorporated the role of information and communication technology (ICT) in complementing financial development aimed at achieving sustainable economic growth. The growing importance of ICT in driving economic growth through financial development is central to this debate (Abu-Bader & Abu-Qarn, 2008). This is because the diverse nature of ICT as tools and resources used to communicate, develop, disseminate, store and manage information is important to financial sector development. In its basic form, ICT is a collection of technologies and applications that allows electronic processing, storing and retrieval of information amongst a diverse and wide group of users (Carmen, 2015).

The ability of ICT to exchange data across multiple locations and drive the decentralisation of information processing has resulted in a change in the nature and complexion of financial services. A theoretical basis for a better understanding of how technological innovation drives the finance-growth nexus is to use a variant of the endogenous growth theory linking perpetual expansion in output per capita to technological progress, which drives financial development and facilitates investment as well as output growth (Romer, 1990). This variant extends the original version of the model, which overcomes the diminishing returns tendency of the capital-output ratio of the original Solow model (Solow, 1956). The increasing importance of ICT in driving output expansion in modern economies has provided empirical evidence for this variant of the endogenous growth theory across different regions of the world (Barro, 1998). In addition, the rise of cheap and affordable technological tools has spread the use of technology in a variety of financial services to all regions of the world, especially developing countries (Carmen, 2015).

The importance of ICT as a driver of financial development and economic growth is obvious for various reasons. Firstly, the rise of the Internet has been at the forefront of ICT diffusion because it has transformed society by reducing the cost of transferring data and information. It has been estimated that, the average cost of transferring data and information has been reduced by multiple hundreds of dollars

in the past decade (McKinsey Global Survey, 2020). This has been identified as a major driver of economic growth and financial development. Secondly, ICT has emerged as one of the world's fastest-growing industries and drivers of economic growth. For instance, a study showed that a 10% increase in broadband penetration in developing countries would add 1.4% to their GDP (Kvochko, 2013). Similarly, another study showed that a 10% increase in broadband penetration would expand national output by 1.2% in developed economies and 1.38% for developing economies (Minges, 2015). In addition, for Asia, a 1% increase in broadband penetration would grow GDP by 0.458% (Alam et al., 2019). Thirdly, ICT has changed the development of finance with the domination of financial services by automation through ICT gadgets like automated teller machines (ATMs), electronic fund transfers (EFTs), clearing house automated payments (CHAPs), electronic purses (E-PURSEs), automated check sorters (ACSs) and electronic funds transfer at point of sales (EFTPOS) (Odhiambo, 2008). All these technological innovations have transformed financial services and improved the way financial development drives economic growth.

It is against this background that the need to understand whether ICT diffusion drives the finance-growth nexus of countries in sub-Saharan Africa (SSA) has become an important avenue for providing better insight into the growth trajectory of African economies. A body of growing literature has identified three channels through which ICT drives economic growth (Vu, 2011). Firstly, knowledge frontier countries easily transfer innovation and diffuse knowledge to those behind the frontier through financial services, and this process ultimately drives economic growth. Secondly, ICT improves the quality of the decision-making process followed by both firms and households through the efficient deployment of both resources, and this ultimately spurs economic growth. Thirdly, ICT penetration reduces the cost of production, increases investment and expands national output (Dimelisa & Papaioannou, 2010).

An important motivation for the study was that empirical evidence on how financial development impacts economic growth has been mixed. For instance, some studies have established a negative impact of financial development on economic growth (Adeniyi et al., 2015; Adusei, 2013; Kenza & Eddine, 2016), while others have reported a reciprocal negative effect between the two variables (Adu et al., 2013; Ductor & Grechyna, 2015; Esso, 2010). These empirical results require further investigation using a specific channel to test how financial development drives or stunts economic growth, and an important channel is ICT diffusion in countries in SSA. Therefore, this study was important for three reasons.

Firstly, the empirical evidence of the finance-growth nexus has been mixed, with some providing either positive or negative results while others being ambiguous. Therefore, the study attempted to provide clarification of the topic. Secondly, the inclusion in the study of ICT diffusion as a channel for driving the finance-growth nexus was an attempt to provide new evidence of how financial development impacted economic growth in SSA during period under study. In addition, the study aimed to show whether, despite the increasing popularity of technologically innovative financial services globally, ICT diffusion drove the relationship between

financial development and economic growth in the selected research context. Thirdly, the study tested whether the dataset for countries in SSA fitted into the supply-leading hypothesis when ICT diffusion was used as the transmission channel for the finance-growth nexus.

The study employed the autoregressive distributive lag (ARDL) technique of a dynamic panel model of mean group (MG), pooled mean group (PMG) and dynamic fixed effect (DFE) estimators. This was based on the number of time series (21) and cross-sections (18) in the study, with large T and small N ($T > N$). Data were collected for 18 countries in SSA covering a 20-year period from 2000 to 2020. These countries were Angola, Botswana, Malawi, Mozambique, Namibia, South Africa, Benin, Burkina Faso, Cape Verde, Mauritania, Nigeria, Senegal, Kenya, Mauritius, Rwanda, Seychelles, Tanzania and Uganda.

This chapter is organised into five sections. The next section discusses the theoretical framework and the literature review, whereas the third section explains the methodology and the data used in the study. The fourth section discusses the results, while the last section concludes the chapter and makes policy recommendations.

2 Literature Review

2.1 Theoretical Literature

The theoretical foundation for understanding how technological progress can lead to a sustainable expansion in per capita output with no diminishing return to capital-output ratio has been linked to technological innovation under the endogenous growth model (Aghion et al., 1998; Barro, 1998; Lucas, 1988; Romer, 1986). This model incorporates technological innovation, the adoption of technology, the transfer of technology and expenditure on research and development as drivers of economic growth. The endogenous growth model developed progressively in several stages. Romer (1990) explains that endogenous theories identified the generation and distribution of ideas as well as information as the drivers of economic growth. The model showed that investment in research and development and the diffusion of technology were the key determinants of long-run expansion in output per worker. This idea was later expanded in several successive studies to include the effects of technological spill-over on trade, for example:

In the study, the theoretical foundation for the analysis of the finance-growth nexus was the supply-leading and demand-following hypotheses. These hypotheses explain two divergent views on the direction of causality between financial development and economic growth. According to the supply-leading hypothesis, causality runs from financial development to economic growth because the rapid improvement in the quality and quantity of financial services can serve as drivers of economic growth (King & Levine, 1993). However, the demand-following hypothesis indicates that causality runs from economic growth to financial development

because rapid expansion in national output is expected to increase the demand for financial services (Calderón & Liu, 2003; Singh, 1999). The role of technological innovation in driving economic growth through financial development can therefore be linked to the endogenous growth theory. In this sense, economic growth stems from massive investments in human capital, research and development and technological innovations. This framework can, therefore, be modified to incorporate ICT diffusion as stimulating economic growth through financial development. In specific terms, under this extension of the endogenous growth model, the diffusion of ICT reduces financial transactions, increases their speed, changes their dynamics and makes them more efficient. Therefore, these attributes will increase the capacity of financial services to drive economic growth or, conversely, be driven by economic growth.

2.2 Empirical Review

2.2.1 Finance-Growth Nexus

The literature on the finance-growth nexus can be traced to the pioneering works of Schumpeter (1911). This was followed by successive influential studies that provided empirical evidence of the relationship between financial development and economic growth (Gurley & Shaw, 1960; McKinnon, 1973; Shaw, 1973). These pioneering works showed that rapid development of the financial sector increases the mobilisation of funds, stimulates the efficient allocation of resources and, ultimately, spurs economic growth.

The empirical literature on the finance-growth nexus has resulted in a puzzle because it has produced conflicting results. On the one hand, there are several studies that reported a positive relationship between financial development and economic growth (see Arestis et al., 2001; Huang & Lin, 2009; Uddin et al., 2013). This positive relationship was extended to include the direction of causality between the two variables. However, some studies established a negative relationship between financial development and economic growth, while others produced inconclusive results (Andersen & Tarp, 2003; Naceur & Ghazouani, 2007). Specifically, Arestis et al. (2001) established a positive effect of financial development on economic growth for a small group of developing countries. In addition, Huang and Lin (2009) used a novel threshold regression with an instrumental variable approach to report a positive relationship between financial development and economic growth for a large sample of countries. The results also indicated that the effect was large for low-income countries. In their studies of African countries, Kargbo and Adamu (2009) and Uddin et al. (2013) found evidence of a positive relationship between financial development and economic growth for both Sierra Leone and Kenya, respectively. Moreover, Rafindadi and Yusof (2015) established a short- and long-run effect of financial development on economic growth for Nigeria. Some studies also found a negative relationship between financial development and economic

growth. For example, Adeniyi et al. (2015) reported a negative effect of financial development on economic growth, but interestingly, this negative effect turned positive when allowance was made for the threshold effect. Furthermore, Kenza and Eddine (2016) and Barajas et al. (2011) showed that financial development affects economic growth negatively for MENA countries. In the same vein, Ibrahim and Alagidede (2018) employed the Hansen threshold technique and reported that below the 11% threshold level, financial development hardly accounted for growth in national output.

Favara (2003) used diverse econometric methods on a large dataset of 87 countries and found that there was no positive relationship between finance and growth. In another study, Ductor and Grechyna (2015) adopted a system-generalised method of moments (s-GMM) estimation technique and found that financial development stunted economic growth for a group of countries. Samargandi et al. (2015) reported that a large service sector relative to the real sector may explain why finance may be detrimental to growth in some developing countries and resources mobilised by the financial sector may not finance expansion in output. Interestingly, Ruiz-Vergara (Ruiz, 2018) and Fufa and Kim (2018) used the dynamic panel threshold estimator and the GMM technique, respectively, and found that the positive impact of finance on economic growth is larger for rich countries than it is for poor ones.

2.2.2 Innovation and the Finance-Growth Nexus

Recent empirical literature on the finance-growth nexus has been extended to investigate how technological innovation can serve as a channel of interaction between finance and economic growth. For instance, Sassi and Goaied (2013) showed that financial development stunted economic growth in a group of 17 MENA countries, while ICT diffusion positively impacted it. In the same vein, Salahuddin and Gow (2016) established a long-run positive relationship between economic growth and a group of variables, which included Internet usage, financial development and trade openness.

Other studies have found a positive impact of ICT diffusion on economic growth and other macroeconomic variables. For example, Hofman et al. (2016) showed how investment in ICT drives economic growth, while Pradhan et al. (2018) reported a unidirectional causality from ICT infrastructure to economic growth. Nour and Satti (2002) found that ICT expenditure impacted economic growth positively amongst MENA countries, while Lee et al. (2005) showed that causality ran from growth to ICT investment in developing countries. Alimi and Adediran (2020) provided evidence that financial development drove economic growth when this interaction incorporated ICT diffusion.

Interestingly, there have been numerous studies establishing a negative or inconclusive relationship between innovative financial services and economic growth. For instance, Bateman et al. (2019) have showed that the impact of technology-driven financial services on poverty alleviation may have been exaggerated. The study reviewed a popular article that established a positive relationship between fintech

and poverty alleviation in Kenya and found that the results may have been exaggerated (see Suri & Jack, 2016). In addition, Rafindadi and Yusof (2015) established a negative impact of financial development on economic growth in Nigeria, while Ductor and Grechyna (2015) revealed that financial development may stunt economic growth if the increase in private credit is not used to expand real output. Ductor and Grechyna (2015) study used data on the West African region and employed the extended endogenous growth theory as its theoretical framework. The study that is the focus of this chapter aimed to contribute to the existing literature by providing evidence of how ICT diffusion might impact the finance-growth nexus in SSA.

3 Methodology

3.1 Model Specification

In line with the finance-growth nexus, the model was specified thus:

$$\mathrm{GDP}_{gr_{i,t}} = \alpha_i + \beta_1 \mathrm{TOP}_{i,t} + \beta_2 \mathrm{ICTI}_{i,t} + \beta_3 \mathrm{DCP}_{i,t} + \mu_{i,t} \tag{1}$$

where GDP_{gr} was the growth rate of GDP, α was the country-specific intercept and TOP represented the trade openness of chosen countries, which was exports plus imports as a percentage of GDP. Following the works of Salahuddin and Gow (2016); Rafindadi and Almustapha (2017); and Alimi and Adediran (2020), the study included TOP to account for the integration of countries in SSA with the rest of the world. Moreover, ICTI represented the diffusion of the information and communication technology index. This was obtained using the principal component analysis (PCA) of mobile phone subscribers per 100 people, fixed telephone subscribers per 100 people and broadband Internet subscribers per 100 people. PCA is a statistical technique used for data reduction. The leading eigenvectors from the eigen decomposition of the correlation or covariance matrix of the variables described a series of uncorrelated linear combinations of the variables that contained most of the variance. DCP represented domestic credit to the private sector as a percentage of GDP. This was used to measure the financial development of individual countries, while μ was the error term, and $'i'$ and $'t'$ represented country and period. However, an interaction of financial development with ICT diffusion was later incorporated in the analysis to know its effect on growth.

The data covered the period from 2000 to 2020, while 6 countries each were chosen from East Africa, Southern Africa and West Africa, totalling 18 countries. The countries chosen from Southern Africa were Angola, Botswana, Malawi, Mozambique, Namibia and South Africa. Benin, Burkina Faso, Cape Verde, Mauritania, Nigeria and Senegal were chosen from West Africa. Kenya, Mauritius,

Rwanda, Seychelles, Tanzania and Uganda were chosen from East Africa. These countries were chosen based on data availability.

To analyse the dynamic nature of the series and the impact of ICT diffusion on the finance-growth nexus as shown in Eq. (1), the study used a recent advance provided by Pesaran and Smith (1995) and Pesaran et al. (1997, 1999) in the estimation of stationary and non-stationary heterogeneous panels with both large *N* and *T*. This was used with a stata command "xtpmg", which estimated three alternative models, the preferred result of which was guided by the Hausman estimation test. This recent method, as proposed by Pesaran and Smith (1995), followed a traditional dynamic fixed effect estimator (DFE), which relied on the pooling of cross-sections; a mean group (MG) estimator, which relied on an average of cross-sections; and an estimator that relied on a combination of the pooling and averaging of coefficients, known as a pooled mean group (PMG) estimator. Moreover, both the short- and long-run effects could be estimated simultaneously from a dataset with a large cross-section and time dimension. Given this, the ARDL model (MG, PMG and DFE) provided consistent coefficients despite the possible presence of endogeneity because it included lags of dependent and independent variables (Pesaran et al., 1999).

In conventional panel data, the number of time-series observations (T) is usually less than the number of cross-sections (N). However, in recent times, as could be seen in the study, the number of time-series observations (T) and the number of cross-sections are quite large and in the same order of magnitude (T = 21, N = 18). In situations like this, the usual practice is either to estimate N in separate regressions and calculate the coefficient means and the MG estimator or to pool the data and assume that the slope coefficient and the error variance are identical. Moreover, the intermediate procedure, the PMG estimator, was introduced by Pesaran et al. (1997). This procedure allows the short-run coefficient and error variance to differ across groups.

According to Pesaran et al. (1997), the use of traditional procedures for the estimation of pooled models, such as the fixed effect, instrumental variable or the GMM estimator as proposed by Anderson and Hsiao (1981, 1982), Arellano and Bover (1995) and Ahn and Schmidt (1995), amongst others, produces inconsistent and a potentially very misleading estimate of the average values of the parameters in a dynamic panel model only if or unless the slope coefficients are identical, which might be impossible. Hence, there is need for another technique. Furthermore, in most panels, tests show that these parameters differ significantly across groups. Hence, an estimator such as an MG or a PMG which imposes a weaker homogeneity assumption would be necessary. An MG and a PMG are used in analysing long-run effects and the speed of adjustment to the long run.

If the variables are stationary at first difference, i.e. I(1), and co-integrated in the three models, then the error term is I(0) for all *i*. A major feature of co-integrated variables is their responsiveness to any deviation from long-run equilibrium. This feature implies an error correction model in which the short-run dynamics of the variables in the system are influenced by the deviation from equilibrium (Blackburne III & Frank, 2007; Pesaran et al., 1999). The ARDL (1,1,1) dynamic panel specification of Eq. (1) was:

$$\begin{aligned}\mathrm{GDP}_{gr_{i,t}} &= \Phi_{10i}\mathrm{TOP}_{i,t} + \Phi_{11i}\mathrm{TOP}_{i,t-1} + \Phi_{20i}\mathrm{ICTI}_{i,t} + \Phi_{21i}\mathrm{ICTI}_{i,t-1} \\ &\quad + \Phi_{30i}\mathrm{DCP}_{i,t} + \Phi_{31i}\mathrm{DCP}_{i,t-1} + \Phi_{40i}\mathrm{DCPICTI}_{i,t} \\ &\quad + \Phi_{41i}\mathrm{DCPICTI}_{i,t-1}\lambda_i\mathrm{GDP}_{gr_{i,t-1}}\mu_i + \varepsilon_{i,t} \end{aligned} \tag{2}$$

The error correction re-parameterisation of Eq. (2) was:

$$\begin{aligned}\Delta\mathrm{GDP}_{gr_{i,t}} &= \Omega_i\left(\mathrm{GDP}_{gr_{i,t-1}} - \alpha_{0i} - \alpha_{1i}\mathrm{TOP}_{i,t} - \alpha_{2i}\mathrm{ICTI}_{i,t} - \alpha_{3i}\mathrm{DCP}_{i,t} - \alpha_{4i}\mathrm{DCPICTI}_{i,t}\right) \\ &\quad + \Phi_{11_i}\Delta\mathrm{TOP}_{i,t} + \Phi_{21_i}\Delta\mathrm{ICTI}_{i,t} + \Phi_{31i}\Delta\mathrm{DCP}_{i,t} + \Phi_{41i}\Delta\mathrm{DCPICTI}_{i,t} + \varepsilon_{i,t} \end{aligned} \tag{3}$$

The error correction speed of adjustment parameter Ω_i and the long-run coefficients α_{1i}, α_{2i}, α_{3i}, α_{4i} in Eq. (3) were of primary interest. With the inclusion of α_{0i}, a non-zero mean of the co-integrating relationship was allowed. Ω_i was expected to be significantly negative under the prior assumption that the variables would show a return to long-run equilibrium. Thus, Eq. (3) was estimated by the three (3) different estimators: MG, PMG and DFE.

4 Results and Data Analysis

4.1 Descriptive Statistics of Variables

In Table 1, the estimated mean value, which was used to examine the nature of the data distribution, was high for TOP with about 74.4132, while GDP growth rate (GDPGR) had the lowest mean value of 4.9061. DCP and GDPGR had a low standard deviation of 3.3296 and 0.8131, respectively. This revealed that both were relatively stable and showed low variability across the countries in the study. However, TOP and ICTI exhibited high variability in the cross-sectional units, judging by their standard deviations.

All variables were positively skewed. The estimated kurtosis statistics of all the variables (GDPGR, TOP, ICTI and DCP) were greater than 3, which indicated that their distribution was thicker, thereby implying the presence of heterogeneity in the data. The Jarque-Bera value for all the variables passed the significance test at 1%. This indicated that all the series were not normally distributed.

Table 1 Summary of statistics

Variable	Mean	Std. dev	Skewness	Kurtosis	Jarque-Bera	Probability
GDPGR	4.9061	3.3296	0.0943	4.8180	49.4707	0.000
TOP	74.4132	38.3102	1.3882	5.1367	183.5938	0.000
ICTI	39.2830	48.0981	2.5652	9.4814	1022.101	0.000
DCP	5.01E-09	0.8131	1.5419	5.3133	222.2922	0.000

Source: Authors' computation (2020). Note: *** indicates significance at 1% level

4.2 Correlation Matrix

In order to examine the background behavioural patterns in the data series of the study, a correlation matrix was conducted on the variables of interest. The results are shown in Table 2.

Table 2 shows that GDPGR has a significant negative correlation with TOP, DCP, ICTI and the interaction of financial development with ICTI (DCPICTI). TOP was significant and positively correlated with DCP, ICTI and ICTI (DCPICTI). While ICTI and DCPICTI were positively correlated, both were also significantly correlated with TOP and DCP.

4.3 Panel Unit Root Tests

The study used the heterogeneous Im Pesaran and Shin (IPS) panel unit root test, the augmented dickey fuller (ADF) test and the homogenous Levin, Lin and Chin panel unit root test to explore the extra power in the cross-sectional dimension of the data. The results of the stationary tests conducted on all the data utilising above-mentioned tests are presented in Table 3.

In Table 3, GDPGR is stationary at level, while TOP, ICTI and DCP are all stationary at first difference. The study proceeded to follow ARDL procedures of a dynamic panel model using MG, PMG and DFE, given the outcome of the panel unit root test. Table 4 shows the ICT diffusion and the finance-growth nexus in SSA.

In testing the hypothesis of slope homogeneity, we used the Hausman (1978) test. The P-values of the Hausman test for PMG and MG were greater than 0.05 (0.613), and hence we did not reject the long-run homogeneity restriction hypothesis. Hence, preference was given to the PMG estimator, as this was found to be consistent and efficient under long-run slope homogeneity. In addition, the PMG estimator was compared with the DFE estimator, and the Hausman test was applied to test the

Table 2 Correlation matrix for variables

	GDPGR	TOP	DCP	ICTI	DCPICTI
GDPGR	1.0000 –				
TOP	−0.1474*** 0.0051	1.0000 –			
DCP	−0.2506*** 0.0000	0.1236*** 0.0192	1.0000 -		
ICTI	−0.2164*** 0.0000	0.3559*** 0.0000	0.3447*** 0.0000	1.0000 -	
DCPICTI	−0.1854*** 0.0000	0.0976* 0.0647	0.3331*** 0.0000	0.8065*** 0.0000	1.0000

Source: Authors' Computation. Note: ***,**,* indicate significant at 1%, 5% and 10%, respectively

Table 3 Panel unit root tests

Variables	Heterogeneous root		Prob.	Homogenous root	Prob.	Order of integration
	IPS	ADF-Fisher		Levin, Lin and Chin		
GDPGR	−5.075	96.378	0.000***	−4.715	0.000***	I(0)
TOP	−4.714	92.624	0.000***	−3.561	0.000***	I(1)
ICTI	−4.735	95.471	0.000***	−3.260	0.000***	I(1)
DCP	−5.636	113.315	0.000***	−5.230	0.000***	I(1)

Source: Authors' computation (2020). Note: *** indicates significance at 1% level

Table 4 ICT diffusion and the finance-growth nexus in SSA

	MG	PMG	DFE
Long-run estimate			
Top	0.040 (0.331)	**−0.034** **(0.000)***	0.027 (0.125)
Dcp	−0.113 (0.653)	**−0.006** **(0.554)**	−0.010 (0.312)
Icti	4.204 (0.468)	**0.688** **(0.046)****	−0.764 (0.198)
Dcpicti	−0.408 (0.113)	**−0.010** **(0.001)***	−0.003 (0.710)
Short run estimate			
Error correction term (ECT)	−1.069 (0.000)	**−0.796** **(0.000)***	−0.747 (0.000)***
d_1.Top	−0.009 (0.798)	**0.033** **(0.331)**	−0.024 (0.059)*
d_1.Dcp	−0.340 (0.131)	**−0.307** **(0.086)***	−0.026 (0.073)*
d_1.Icti	−1.579 (0.852)	**6.511** **(0.317)**	−0.185 (0.808)
d_1.Dcpicti	0.045 (0.918)	**−0.472** **(0.107)**	0.040 (0.038)**
Constant	0.314 (0.959)	**6.241** **(0.000)***	2.378 (0.028)**
No. of obs.	**341**	**341**	**341**
No. of countries	**18**	**18**	**18**
Hausman test	**H_0: βmg = βpmg** **2.68**		**H_0: βdfe = βpmg** **8.13**
Prob.	**0.613** **(failed to reject H_0)**		**0.087** **(failed to reject H_0)**

Source: Authors' computation (2020). Note: Prob. in parenthesis and ***, **, * indicate significance at 1%, 5% and 10%, respectively

difference. The P-values of the Hausman tests for the DFE and PMG estimators were greater than 0.05 (0.087), which indicated acceptance of the null hypothesis.

From the results obtained by the PMG estimator, TOP, ICTI and DCPICTI were statistically significant in determining the impact of ICT diffusion on the finance-growth nexus, but only in the long run. TOP, ICTI and DCPICTI did not show the predicted sign but were statistically significant. TOP and DCPICTI were significant at 1%, while ICTI was significant at 5%. The results showed that an increase in TOP decreased the finance-growth nexus by 0.03%. Moreover, a unit increase in ICTI increased the finance-growth nexus by 0.68%. A unit increase in the interaction of ICTI with DCP decreased the finance-growth nexus by 0.01%.

These results showed that ICT diffusion had a positive impact on economic growth in the long run, but no relationship was found in the short run, indicating that an increase in ICT diffusion would improve economic growth in countries in SSA by 0.69% in the long run. However, the effect of financial development on growth for countries in SSA was ambiguous. Moreover, the interaction term of ICT diffusion and financial development was found to be negative, implying that the combination of ICT and financial development retarded the economic growth of countries in SSA. This corroborated the findings of Sassi and Goaied (2013) that financial development and the interaction of financial development with ICT impacted economic growth negatively in the MENA region. But ICT proxies showed a positive relationship with growth. Furthermore, Das et al. (2018) discovered a positive impact of ICT diffusion on economic growth but found that financial development did not impact growth. However, in their study, the joint effect of ICT and finance was positive for developing countries and insignificant in less and middle-income countries.

The findings of Raheem et al. (2020) also showed that the interaction of ICT and financial development negatively affected growth in G7 countries in the long run but had a positive impact in the short run. Nevertheless, our findings negated those of Cheng et al. (2020), who investigated the relationship between ICT, financial development and economic growth for low-, middle- and high-income countries. Their results showed a negative relationship between financial development and economic growth, although it was greater in high-income countries. While ICT diffusion encouraged economic growth in high-income countries, the effect was ambiguous in low- and middle-income countries. However, in contrast to the findings of Rafindadi and Almustapha (2017) and Alimi and Adediran (2020), the current study found that TOP negatively impact economic growth in the long run in countries in SSA.

In the short run, none of these variables of interest was significant for the period under review. The error correction model (ECM) revealed that the ECT was significant, and it showed a negative value for all variables. According to Engle and Granger (1987), this confirms a co-integration relationship. Also, the ECT incorporated long-run information and showed that any deviation from long-run expected values was adjusted by 79.6% annually.

The study results revealed that in the long run, while the ICT index drove economic growth, the interaction of financial development with the ICT Index was

significantly negative for economic growth in SSA. These results, from a theoretical perceptive, do not support the supply-leading hypothesis, with ICT diffusion as the transmission channel in the finance-growth nexus.

5 Conclusion and Policy Recommendations

There have been numerous attempts at understanding the relationship between economic growth and financial development, which has led to the supply-leading and demand-following hypotheses. In light of these theories, the chapter attempted to contribute to the literature on the finance-growth nexus by using a dataset from SSA reflecting a period of 20 years to achieve two objectives. Firstly, the study tested whether the finance-growth nexus was driven by technological innovation as a transmission channel. Secondly, it tested whether the African dataset fitted the supply-leading hypothesis when technological innovation served as the transmission channel.

As stated above, the chapter constructed an ICT diffusion index using PCA and a dataset representing mobile phone subscribers per 100 people, fixed telephone line subscribers per 100 people and broadband Internet subscribers per 100 people. The study then developed a model with GDP growth rate as the dependent variable, while financial development and trade openness were the independent variables. The index of ICT diffusion was used as the interactive variable in the finance-growth nexus. The model was then estimated using the PMG estimator in the ARDL analysis.

The chapter revealed that financial development had a negative impact on economic growth in SSA during the period under study when driven by technological innovation. This supported previous studies that established a negative impact of financial development interacting with technology on economic growth (see Bateman et al., 2019: Rafindadi & Yusof, 2015: Ductor & Grechyna, 2015: Adeniyi et al., 2015). Some plausible reasons for this finding may be the inability of the private sector to drive output expansion because financial resources are used for non-productive activities. In addition, the informal economy faces the challenge of being financially excluded from the formal economy, which might be another reason.

Therefore, the chapter led to three recommendations. Firstly, countries in SSA should deploy policy options that will simultaneously expand private credit and the growth of the real sector for them to benefit from the anticipated popularity of innovative financial services in the future**.** Secondly, countries in SSA with relatively low technologically driven innovation accompanied by financial inclusion should learn from the more successful regions of Asia how ICT has allowed financial services to drive economic growth. Thirdly, future studies may include some measures of informality to analyse its effects on how ICT diffusion drives the finance-growth nexus.

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Foreign Direct Investment, Tourism, and Financial Development in Africa

Younesse El Menyari

Abstract In this study, we analyzed the impact of foreign direct investment (FDI) and international tourism on financial development in 48 African countries based on data covering the period 1995–2019, by using the System GMM approach. The results of our estimates indicate that FDI inflows and tourism receipts have a positive and statistically significant effect on both financial development indicators (broad money and domestic credit to private sector). These results may have important policy implications as FDI and tourism exports can lead to the adoption of reforms favorable to financial development and serve as a mechanism to improve the depth and efficiency of the financial system.

Keywords Financial development · FDI · Tourism receipts · System GMM · Africa

1 Introduction

The majority of economists consider that financial development is favorable to economic growth (Levine, 1997; McKinnon, 1973; Schumpeter, 1911; Shaw, 1973). Indeed, financial development affects economic growth through several channels: the dematerialization of money, the efficiency of financial intermediation, and the reduction of information problems.

In this context, understanding the factors that could explain financial development has become an important area of research in recent years. Researchers have shown several exogenous and endogenous factors that could explain this development (Adekunle et al., 2020; Bhattacharya et al., 2018; David et al., 2014; Ibrahim & Sare, 2018). This work mainly focuses on the role of FDI and tourism exports on financial development.

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From a theoretical point of view, an increase in FDI would contribute to the growth of economic activities, which induces a stimulation of financial intermediation through the available financial markets or the banking system (Desai et al., 2006; Henry, 2000; Levine, 1997). In addition, an increase in FDI would reduce the relative power of elites in the economy and could encourage them to adopt market-friendly regulations, thereby strengthening the financial sector (Kholdy & Sohrabian, 2005, 2008; Rajan & Zingales, 2003). On the other hand, currency inflows generate from tourism exports lead to monetary expansion of the economy. As a consequence, they increase the official reserves of central banks. A growth in official reserves allows central banks to provide more credit, which leads to an expansion of the financial sector (Katircioglu et al., 2018). Chen (2007) found that tourism development positively influences financial markets.

Empirically, although there are several studies dealing with the effect of financial development on FDI (Al Nasser & Gomez, 2009; Desbordes & Wei, 2017; Yalta, 2013) or the tourism-growth relationship (Balaguer & Cantavella-Jorda, 2002; Bouzahzah & El Menyari, 2013; Brida et al., 2020), the impact of tourism and FDI on financial development has received little attention from researchers. This study seeks to fill this gap in the literature by studying the role of FDI inflows and tourism receipts in financial development in the context of African countries. In fact, it is particularly interesting to examine the case of African countries. The latter are increasingly integrated into the global economy. According to the 2017 UNCTAD Economic Development report in Africa, tourism is a booming sector that accounts for more than 21 million jobs (or one in 14 jobs) in the continent. Over the period 1995–2017, Africa showed dynamic growth; the number of international tourist arrivals increased by 6% and tourism receipts by 7%, which is above the global average that is rising 4% for tourist arrivals and 5% for receipts. Yet, the average annual growth rate (AAGR) of FDI in Africa remains slightly higher than global growth. From 1995 to 2017, the AAGR of FDI inflows in Africa increased by 10% against 9% globally. In addition, in many African countries, financial systems are deepening, and the number of businesses and households with access to financial services, including credit, has increased. The question of the impact of tourism and FDI inflows on the financial sector arises acutely in African countries. So, this study attempts to answer the following question: What is the impact of FDI and tourism receipts on financial sector development in Africa?

This work aims to contribute to research in this area in two ways: first, by examining the impact of FDI inflows and tourism on financial sector development in order to determine to what extent the FDI and attractiveness of tourism improves the financial sector and second, by focusing on African countries so as to obtain more conclusive results regarding the determinants of financial development and by comparing the results with other empirical studies. Indeed, Cannonier and Burke (2017) found that the impact of tourism on financial development is positive and significant, while the effect of FDI on financial development is not significant; at the same time, the study by Katircioglu et al. (2018) concluded that the impact of tourism on financial development is not significant, while FDI inflows have a positive and significant effect on financial development.

The remainder of this chapter is organized as follows: Sect. 2 presents the literature review; Sect. 3 contains the methodology and data; Sect. 4 presents the empirical results and discussion; and Sect. 5 concludes the study with key implication for policy.

2 Literature Review

Based on the work of the Levine (1997, 2005), financial development, which mainly includes banks and financial markets, contributes to a reduction in the information and transaction costs associated with financial operations. In addition, the work of Cihak et al. (2012) has highlighted the multidimensional nature of financial development. These authors proposed a typology of the four dimensions of financial development, namely, (a) depth, (b) access, (c) efficiency, and (d) stability.

Thereby, financial development varies widely across countries and regions. Researchers explain these differences through geographic, political, economic, social and cultural factors. McKinnon (1973) and Shaw (1973) suggest that variations in the levels of financial development across different countries depend mainly on the institutional framework. Rajan and Zingales (2003) presented the theory that supports the links between trade openness and financial development. They imply that by expanding opportunities and increasing competition, openness contributes to financial development. The main determinants of financial development, including institutions, geography, and trade openness, are also recognized as sources of economic growth, implying that the relationship is probably indirect. These factors actually affect economic growth through its financial system. De Gregorio and Guidotti (1995), Calderón and Liu (2003), and Hassan et al. (2011) have emphasized the importance of financial development in promoting economic growth in a large sample of developed and developing countries. In addition, Assefa and Varella Mollick (2017), Ibrahim and Alagidede (2018), and El Menyari (2019) have shown the important role of financial development in accelerating economic growth in Africa. However, the determinants that help stimulate financial development are relatively ambiguous; hence this study attempts to focus on the role of FDI flows and tourism in financial development.

2.1 FDI and Financial Development

The literature does not provide much clarity on the possible link between FDI and financial development. The research that has addressed this question focuses on the role of financial development as a determinant of FDI, so the inverse relationship has been little studied by researchers. On the theoretical level, two main arguments have been put forward to explain the impact of FDI on financial development. First, an increase in net FDI inflows leads to an increase in funds available in the economy.

Consequently, financial intermediation through funds available in the markets or the banking system would improve (Desai et al., 2006; Henry, 2000; Levine, 1997). Second, FDI can improve financial development by putting pressure on elites in the economy, which can encourage them to adapt to pro-market regulations, leading to greater competition in the financial sector (Kholdy & Sohrabian, 2005, 2008; Rajan & Zingales, 2003).

Empirically, Raza et al. (2012) analyzed the role of foreign direct investment in the development of Pakistan's stock market. Using the least squares regression (OLS) method for the annual period 1988–2009, the results reveal a positive impact of FDI on the development of Pakistan stock markets.

Ang (2008) studied the relationship between FDI and financial development, using two indicators of stock market development and three indicators of banking sector development, for nine emerging market economies during the period 1994–2006, in the framework of a simultaneous equation system in panel data. The results of this study show that FDI and stock market development indicators influence each other, positively, while the causality between banking sector development and FDI is ambiguous and inconclusive. Likewise, Al Nasser and Soydemir (2010) perform Granger causality tests between FDI and financial development for Latin American countries. They reveal a two-way relationship between FDI and the stock market and a one-way relationship going from banking sector development to FDI and not the other way around.

Sahin and Ege (2015) studied the link between FDI and financial development for a sample of four countries (Greece, Bulgaria, Macedonia, and Turkey) for the period 1996–2012, using bootstrap causality analysis. The authors evaluated financial development by three types of indicators: domestic credit to private sector as a percentage of GDP, market capitalization to GDP, and stock market turnover ratio. Their findings indicate that FDI has predictive power in forecasting financial development in all countries except Macedonia. In addition, their findings show that there is a two-way causality between FDI and financial development in Turkey.

2.2 Tourism and Financial Development

Unlike the relationship between tourism and economic growth which has been the subject of several theoretical and empirical works (see, e.g., Balaguer & Cantavella-Jorda, 2002; Fayissa et al., 2008; Narayan et al., 2010; Bouzahzah & El Menyari, 2013; Risso, 2018; Brida et al., 2020; EL Menyari, 2021), the relationship between tourism and financial development has received little attention in scientific research.

From a theoretical point of view, international tourism attracts foreign currency which can be used to import capital goods which are then used to produce and export goods and services, which in turn contributes to economic growth (McKinnon, 1964; Nowak et al., 2007). Foreign exchange earnings through international tourism also lead to monetary expansion of the economy, thus increasing the official reserves of central banks. An increase in official reserves allows central banks to provide

more credit. This, in turn, leads to the expansion of financial activities in the economy (Katircioglu et al., 2018).

Empirically, Cannonier and Burke (2017) examined the impact of tourism on financial development in Caribbean economies, during the period 1980–2013, using System GMM. In this study, financial development is measured by three of the four categories developed by Cihak et al. (2012): depth, efficiency, and stability. In short, the results of this study show that tourism spending per capita has a positive and significant effect on financial development. Katircioglu et al. (2018) studied the interactions between tourism and financial development in Turkey over the period 1960 to 2015. The results show that in the long run, there is a one-way causality from tourism revenue to financial development, whereas in the short term, there is no relationship.

Musakwa and Odhiambo (2020) examined the causal link between tourism and financial development in South Africa using data from 1995 to 2017. Results vary depending on the financial development variable used. Thus, there is a short-term and long-term one-way causality from tourism to the wider Mint. However, tourism does not cause the domestic credit provided by financial sector and the market capitalization of national listed companies.

In a very recent work, Ehigiamusoe (2021) studied the link between tourism, financial development, and economic growth in 31 African countries using causality and cointegration tests on panel data. The results show a short- and long-term joint causality of tourism and economic growth to financial development.

Based on the studies reviewed, the results are inconclusive. Likewise, the study of the relationship between FDI, tourism, and financial development has received little attention in the scientific literature. This study seeks to fill this gap by focusing on the impact of FDI and tourism receipts on financial development in the African context.

3 Methodology and Data

3.1 Methodology

It should be recalled that the objective of this work is to study the factors explaining the financial development process by highlighting the role of FDI and tourism receipts. Specifically, our financial development model can be presented as:

$$\mathrm{FD}_{it} = f(\mathrm{FDI}_{it}, \mathrm{TR}_{it}, X_{it}) \tag{1}$$

where FD_{it} is a vector of financial development in country i at t and FDI_{it} and TR_{it} represent FDI inflows and tourism receipts, respectively, while $\boldsymbol{X_{it}}$ represents a vector of control variables such as human capital, real GDP per capita, inflation, remittances, and trade openness.

The empirical specification retained previously (Eq. 1) requires recourse to the use of estimation techniques on panel data. These techniques have the advantage of

taking into account the specifications of each country using observable and individually specific variables. They also make it possible to distinguish the differentiated effects from unobservable variables, effects specific to time or to the country.

However, most of empirical studies assessing the determinants of financial development suffer from the problem of endogeneity because many of the determinants are themselves affected by financial development. In order to obtain convergent estimators and to avoid the problems of a spurious regression, our estimation is essentially based on the estimation method known as System GMM. This method makes it possible to deal with the problem of endogeneity of the variables. It consists in combining for each period the equation in first difference with that in level. In the first difference equation, the variables are instrumented by their level values delayed by at least one period. Moreover, in the level equation, the variables are instrumented by their first differences delayed by one period. Thus, the use of instrumental variables corrects the endogeneity of the explanatory variables.

We specify financial development equation as a function of its initial values, human capital, FDI, tourism receipts, and other control variables in the following form:

$$\mathrm{FD}_{it} = \beta_0 + \beta_1 \mathrm{FD}_{it-1} + \beta_2 \mathrm{FDI}_{it} + \beta_3 \mathrm{TR}_{it} + \beta_4 X_{it} + \delta_i + \theta_t + \varepsilon_{it} \qquad (2)$$

where $FD_{it\ -\ 1}$ is the lagged finance; δ_i is unobserved country–specific effects; θ_t is the time effects, and ε_{it} is the idiosyncratic error term, while the other variables are as previously defined.

3.2 Data

We perform an econometric analysis on 48 African countries during the period 1995 to 2019. Thus, the variables used in the empirical analysis are taken from the World Bank database (World Bank, 2020).[1] To measure the development of the financial system, we consider two measures: depth and efficiency. These include broad money (% of GDP)[2] as a measure of the depth of the financial system and domestic credit to

[1] The countries are Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cabo Verde, Cameroon, Central African Republic, Chad, Comoros, Congo, Dem. Rep., Congo Rep., Cote d'Ivoire, Egypt Arab Rep., Equatorial Guinea, Eswatini, Ethiopia, Gabon, The Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Libya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Sudan, Tanzania, Togo, Tunisia, Uganda, Zambia, and Zimbabwe.

[2] As defined by the World Bank Board, money includes the sum of currency outside banks; demand deposits other than those of the central government; the time, savings, and foreign currency deposits of resident sectors other than the central government. It also includes bank and traveler's checks and other securities such as certificates of deposit and commercial paper.

private sector (% of GDP)[3] as a measure of the efficiency of the financial system. It should be noted that we did not take into account capital market development in this study because of the data unavailability for majority of our sample countries.

To capture the impact of FDI inflows and tourism revenue on the development of the financial system, we use the share of foreign direct investment inflows in GDP (FDI) and the share of international tourism receipts in GDP (TR). The expected sign of these two variables is positive.

To measure the impact of human capital on financial development, we use the secondary school enrollment rate (HC) as a proxy. This variable is assumed to have a positive influence on financial development (see Ibrahim & Sare, 2018; Satrovic, 2017). The underlying assumption is that human capital development can promote financial development by reducing information gaps and increasing demand for different financial instruments (Barro et al., 1995; Gurley & Shaw, 1967; Hatemi-J & Shamsuddin, 2016; Ho, 2013).

We also include other controls such as real GDP per capita measured in constant 2010 US dollars (RGDPPC), trade openness which is measured by the sum of exports and imports of goods and services as a share of GDP (Trade), remittance inflows to GDP (Remit), and inflation which is measured as the annual percentage change of the consumer price index (Inf).

4 Empirical Findings and Discussion

Table 1 presents, for the period from 1995 to 2019, the descriptive statistics of all the variables used in the framework of our empirical analysis for all African countries. Reading this table shows that the domestic credit to private sector as a percentage of

Table 1 Descriptive statistics

Variable	Number of observations	Mean	Standard deviation	Minimum	Maximum
DC	1061	20.81718	25.39653	0.000	160.1248
BM	1147	32.95109	26.15057	2.857408	251.6179
HC	1200	24.74552	28.75176	5.28340	109.4441
RGDPPC	1191	2251.15	2856.496	183.5479	20532.95
Trade	1149	68.74752	32.12885	14.77247	311.3541
Remit	1001	3.961078	8.05515	0.0001832	108.4032
FDI	1193	3.943473	9.130147	−11.6248	161.8238
TR	1025	3.199849	4.079696	0.000263	26.63978
Inf	1051	9.558311	32.4681	−9.797647	541.9089

[3] Refers total financial contributions through loans, trade credits, and other accounts receivable to private sector by financial corporations such as monetary authorities, deposit money banks, finance and leasing companies, money lenders, insurance corporations, and pension funds.

GDP (DC) is 20.8%, while broad money as a percentage of GDP (BM) represents on average 32.95%. This table also shows that these countries have an average per capita income of 2251.15. The average value of other values, in particular the share of FDI in GDP and tourism receipts as a percentage of GDP, represents 3.9% and 3.2%, respectively.

Table 2 below shows the correlations between the variables. The FDI variable is weakly correlated with the variables related to financial development. The variable of tourism receipts as a percentage of GDP represents a fairly high correlation with respect to the broad money, with a coefficient of 65%, while this coefficient rises to 45% with respect to the ratio of private credit as a percentage of GDP.

The different results obtained using the System GMM method are presented in Table 3. The two tests associated with this method, in particular the Arellano and Bond (1991) tests for the absence of autocorrelation and the Sargan over-identification test, lead to similar results with the different models. The hypothesis of the absence of second-order autocorrelation of the residuals is rejected in all models. On the other hand, Sargan's test leads us to systematically accept the hypothesis of validity of the instruments selected. Finally, the significance of the lagged financial development indicators confirms the relevance of dynamic modeling.

The variable measuring human capital is the secondary school enrollment rate. This variable is positive but not significant.

Contrary to expectations, the results show that income (GDP per capita) has a negative and statistically significant impact on the private credit ratio as a percentage of GDP in Model 3.

The results of the System GMM method also show that inflation has a negative and significant impact on the broad money. This result implies that greater macroeconomic instability via the variability of inflation negatively affects the money supply for all African countries, *all other things being equal.* However, the inflation coefficient is negative and not significant on the domestic credit to private sector as a percentage of GDP.

Regarding FDI, the impact of FDI inflows on financial development is positive and significant. This means that FDI can play the driving role in the development of the financial system of African countries, whether at the level of financial deepening (measured by the broad money) or at the level of the efficiency of the financial system (measured by the domestic credit to private sector as a percentage of GDP).

Likewise, our results indicate that tourism revenues exert a positive and statistically significant impact on financial development in Africa. This implies that efforts to accelerate tourism will also improve financial development. It should be noted that this finding is consistent with the study by Cannonier and Burke (2017). Indeed, tourism receipts lead to an increase in financial deepening and also an increase in the efficiency of the financial system.

Unlike FDI and tourism receipts, our results show that the impact of the remittances/GDP variable on financial development is not significant. This result is in

Table 2 Variables correlation matrix

	DC	BM	HC	FDI	TR	RGDPPC	Trade	Inf	Remit
DC	1.0000								
BM	0.7505	1.0000							
HC	0.5122	0.5307	1.0000						
FDI	−0.0328	0.0337	−0.0082	1.0000					
TR	0.4462	0.6458	0.3949	0.0903	1.0000				
RGDPPC	0.5133	0.4589	0.3922	−0.0928	0.2404	1.0000			
Trade	0.1412	0.2244	0.1917	0.3043	0.3285	0.3152	1.0000		
Inf	−0.1495	−0.1443	−0.0815	−0.0070	−0.0949	−0.1591	−0.1110	1.0000	
Remit	0.0212	0.2052	0.1007	0.0411	0.2554	−0.1716	0.2232	−0.1181	1.0000

Table 3 The impact of tourism and FDI on FD

	Dependent variable: DC			Dependent variable: BM
	1	2	3	4
Lagged FD	0.997*** (0.023)	1.049*** (0.028)	1.057*** (0.023)	0.971*** (0.023)
FDI	0.068* (0.038)	0.068* (0.040)	0.080* (0.043)	0.050*** (0.013)
TR	0.303* (0.169)	0.400* (0.210)	0.404*** (0.144)	0.362* (0.206)
HC	0.002 (0.005)	0.002 (0.007)	0.001 (0.006)	0.007 (0.007)
RGDPPC		−0.001 (0.000)	−0.001** (0.000)	0.0001 (0.000)
Trade	0.011 (0.014)			
Inf	−0.05 (0.035)		−0.042 (0.033)	−0.105** (0.045)
Remit		−0.026 (0.052)	0.035 (0.106)	
Constant	−1.09 (0.822)	−0.034 (0.623)	0.320 (0.815)	0.470 (0.670)
Wald chi2 (Prob> chi2)	3504.73 (0.000)	9548.95 (0.000)	7323.31 (0.000)	4287.51 (0.000)
Sargan test (*p*–value)	39.375 (0.629)	41.661 (0.529)	37.177 (0.721)	44.285 (0.417)
AR(1) (*p*–value)	−1.968 (0.049)	−2.047 (0.040)	−2.002 (0.045)	−4.294 (0.000)
AR(2) (*p*–value)	0.485 (0.627)	0.378 (0.704)	0.530 (0.595)	−0.677 (0.497)
Number of Observations	766	795	752	850

Notes: *, **, and *** denote significance at 10, 5, and 1%, respectively. Robust standard errors are in parenthesis below the coefficients

contradiction with the studies of Bhattacharya et al. (2018) and Adekunle et al. (2020) which found a positive and statistically significant effect of the relationship between remittances and financial development. In this regard, African countries must create a favorable institutional and financial environment on which inflows of foreign funds can be based.

Likewise, the effect of trade openness on the efficiency of the financial system is positive but not significant. This finding is consistent with the results obtained by David et al. (2014) who did not find a robust link between trade, the opening of the capital account, and financial development in sub-Saharan Africa.

5 Conclusion and Policy Implications

This study aims to empirically analyze the role of FDI inflows and international tourism in financial development. On a sample composed of 48 African countries using the System GMM approach during the annual period 1995–2019, our main results show that FDI inflows and tourism receipts have a positive and statistically significant effect on both financial development indicators that were taken into account (the domestic credit to private sector as a percentage of GDP and broad money as a percentage of GDP). However, our results indicate that remittances and trade openness do not have a significant impact on financial development.

Thus, the results of this work should lead decision-makers in African countries to trigger an influx of FDI through the implementation of major reforms of their investment policies aimed at reducing the risks associated with their economies and creating an enabling legal, fiscal, and regulatory environment for foreign investors. The results also show that international tourism receipts in Africa helps support financial development. Thereby, decision-makers should adopt long-term tourism strategies on the supply and demand side aimed at improving the attractiveness of destinations.

As a research perspective, we assume that the use of microeconomic data including a sample of multinational enterprises would be interesting, as it would allow to study the repercussions of the FDI inflows on the depth and efficiency of the financial system.

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Effect of Bank Mergers on Cost of Capital: Evidence from India

Shreya Biswas and Nivedita Sinha

Abstract This chapter examines the effect of the recent bank merger in India on the cost of raising debt and equity for the sample of merger-affected firms. Our multiple linear regression model with industry fixed effects suggests that the bank mergers in India are related to a higher overall cost of capital for the borrowers of merger banks. The higher cost of capital is driven by the higher cost of equity for the firms. This finding contrasts with the results in the developed economies where bank mergers essentially affect the interest rates of loans. The merger is associated with a higher cost of equity for the borrowers, and this can be attributed to the shareholder's perceived increase in the risk of these firms. Our results are also robust to using panel data models with firm fixed effects. The firms in emerging market economies like India predominantly rely on bank loans as the source of capital, and bank mergers can be associated with loan portfolio rationalization in the post-merger period that can adversely affect the credit availability of the borrowers. The empirical evidence indicates that bank mergers do not affect the capital structure of the firms post-merger, indicating the absence of substitution of equity for debt following the merger. We find that bank mergers can have a negative spillover effect on the cost of equity capital for the borrowers in the short run. The findings suggest that the welfare effect of bank mergers in emerging markets with less than fully developed financial markets can be more complicated and alter investor's expectations.

Keywords Bank · Merger · Consolidation · Cost of equity · Cost of debt · Cost of capital · Borrowers · CAPM · Risk · Capital structure · Debt-equity ratio

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1 Introduction

The consolidation in the banking industry has economy-wide implications. In the banking literature, the gains from bank mergers come from two major sources—increases in market power and efficiency. Studies have suggested that bank mergers improve the cost and profit efficiencies in the US banking industry (Al-Sharkas et al., 2008; Houston et al., 2001). The efficiency gains on account of bank mergers or restructuring have also been documented in emerging economies with a weaker regulatory environment, including Indonesia (Defung et al., 2016), Turkey (Gunay, 2012), and others. (Gelos & Roldos, 2004) find that owing to the consolidation in the banking industry, the number of banks in the emerging market economies has gone down; however, consolidation was not associated with a statistically significant fall in competition in the banking industry. Others have highlighted that bank mergers can be detrimental as it increases the default risk of safe banks (Vallascas & Hagendorff, 2011).

Bank mergers and their effect on borrowers are of prime interest in the merger literature as bank debt is the prime source of financing for firms, especially in emerging market economies. Banks have the advantage in emerging economies as the provider of capital as they can because of economies of scale obtain information and reduce the information asymmetry between firm and its lenders (Diamond, 1984). (Allen et al., 2012) examined the various sources of firm financing in India for over 8300 firms and shows that debt from banks is the single largest source of capital for large and small and medium enterprises in India. In another study, (Ghosh, 2007) find that bank debt concentration is high among small and large firms in India and banks play a monitoring role in smaller firms. Given the importance of bank debt in firm financing in emerging economies, any policy or regulation affecting the banking industry is likely to be important for firms as well.

In this chapter, we examine the effect of a bank merger on the borrowers in the context of India, an emerging market economy. The Indian banking industry is regulated by the central bank, Reserve Bank of India (RBI). The banking sector is dominated by public sector banks (PSBs), where the Government of India (GoI) is the majority shareholder. The PSBs in India are facing an increasing non-performing assets (NPA) problem for several years. GoI decided to merge several PSBs to improve the efficiency of the banking sector by merging weak banks with strong banks. In September 2018, GoI approved the merger of three PSBs, namely, Bank of Baroda, Vijaya Bank, and Dena Bank, into one banking entity by April 1, 2019. Dena bank was the weakest of the three banks with over 11% NPA ratio, whereas Vijaya Bank and Bank of Baroda had much lower NPA ratios in 2018. Post-merger the operations of all the three banks were set to continue under the aegis of Bank of Baroda. This merger (henceforth BoB merger) was one of the major announcements in the Indian banking landscape and was the first three-way bank merger in India. The BoB merger was highly debated in the media regarding whether the costs associated with the merger will outweigh the benefits or not. In this chapter, we

specifically study the effect of the BoB merger on borrowers of the three merger-affected firms just after the merger in 2019.

In this chapter, we find that the BoB merger is associated with an increase in the cost of capital for the borrowers of merged banks. However, the increase in the cost of capital is not driven by the cost of debt, unlike the theoretical prediction and evidence from developed economies. The higher cost of capital is primarily driven by the higher cost of equity for the borrowers of merged banks. This can be attributed to the investor's perception of an increase in financing constraints faced by these firms following the merger. This higher probability of financing constraints increases the risk associated with equity investment and is related to the higher cost of equity capital. The contribution of this study is twofold. There is a rich literature on bank mergers and its effects in the context of developed countries; however, the emerging economy-specific studies are still scant. This chapter provides additional evidence of the effect of bank mergers on borrowers in an emerging market economy like India. Secondly, our study provides evidence regarding the spillover effect of bank mergers on the cost of equity.

The rest of the chapter is organized as follows. Section 2 discusses the background literature, while Sect. 3 describes the data used in the study and the variable definitions. Section 4 elaborates the methodology of the paper, and Sect. 5 presents the results. Finally, Sect. 6 concludes and highlights the implications of bank consolidation in India.

2 Background Literature

There is a large literature that examines the effect of bank mergers for corporations. It is less clear whether the gains from mergers are at the expense of the borrowers or have positive spillover effects on bank borrowers as well. Several studies during the last two decades have analyzed the effect of bank mergers on its borrowers. The first approach examines the short-run effect of bank merger announcements on the stock prices of the borrowers. (Fraser & James, 2011) indicate that the reaction of borrowers to bank merger announcements will depend on how they view the cumulative effect of factors such as relationship banking, the market power of banks, and achievement of economies of scale and scope by merging banks. Borrowers respond positively to the announcement if they expect banks to benefit from economies of scale and scope through mergers, negatively if they expect a rise in the bank's market power, and if they expect a disruption in relationship banking. (Fraser & James, 2011) find that borrowers react negatively to the announcement of bank mergers in the USA as they perceive an increase in the market power of merging banks.

Studies such as (Karceski et al., 2005) highlight the asymmetric effect of mergers on borrowers of acquirer and target banks and find that bank merger announcements in Norway were related to a fall in the equity value of the borrowers of target banks; however, the borrowers of acquirer banks experience an increase in stock value.

Some studies suggest that bank mergers reduce the availability of credit for smaller firms (Berger & Udell, 1996 and Peek & Rosengren, 1996) and capital-constrained firms and find a negative response by borrower firms of merging banks that are credit-constrained (Carow et al., 2004).

The second set of studies have examined the effect of bank mergers on borrower's credit behavior. Using data on loan contracts between firms and their bankers (Sapienza, 2002) find that if small banks are acquired, then post-merger, the interest rate falls and benefits the borrowers. On the other hand, (Patti & Giorgio, 2007) find that mergers of Italian banks adversely affected the credit availability of borrowers in the medium run. Similarly, (Degryse et al., 2011) find that bank mergers in Belgium adversely affect the credit availability of the target bank's small borrowers. Further, mergers of banks having geographical overlap are likely to be related to the closure of branches in the same locality in order to rationalize costs and improve efficiency. Such closure of branches can have a negative effect on local credit markets (Nguyen, 2019). Bank mergers have been found to be related to higher public disclosure by the merger-affected firms (Chen & Vashishtha, 2017). The theoretical model of (Petersen & Rajan, 1995) suggests that as bank competition increases, it limits the interest that can be charged by the banks, and this, in turn, reduces bank credit to riskier firms in the market. Consistent with this theory, (Zarutskie, 2006) find that bank deregulation is linked to less outside debt for newer private firms, which are characterized to be risky.

3 Data and Variables

The data for the study is obtained from Prowess dx maintained by the Centre for Monitoring Indian Economy (CMIE). The Prowess database provides financial information on listed and unlisted firms in India. Further, it also contains information regarding the industry of the firms and the bankers of each firm during the financial year. We consider the National Stock Exchange (NSE)-listed firms in India and obtain their financial information for the years 2018 and 2019 to study the effect of BoB merger in India that was announced in September 2018. The financial year ending March 2018 corresponds to the year before the BoB merger, and the financial year 2019 corresponds to the year post the BoB merger.

We consider three dependent variables in our analysis – the cost of capital (CoC), cost of debt capital (CoD), and cost of equity capital (CoE). The CoC is calculated as the weighted sum of after-tax CoD and CoE where the weights are the ratio of debt to capital and ratio of equity to total capital of the firm, respectively, discussed further in Sect. 4.3. The CoD variable is estimated by assigning the synthetic credit rating to a firm using the interest coverage ratio. After assessing the synthetic credit rating, we use the default spread which, when added to the risk-free rate of Indian government t-bill, yields a pre-tax CoD for the firm. The calculations are discussed further in Sect. 4.2. The CoE is calculated with the help of the standard capital asset pricing model (CAPM) discussed further in Sect. 4.1.

We identify the firms affected by the BoB merger by matching the firms in 2018 that had outstanding banking relations with either Bank of Baroda, Vijaya Bank, or Dena Bank. We define a *treat* dummy that takes the value one if the either Bank of Baroda, Vijaya Bank, or Dena Bank are the bankers of the firm and zero otherwise. Further, we consider a dummy *post* that takes the value one for the year 2019 and zero for pre-merger period, i.e., 2018. Finally, we define an interaction between *treat* and *post* dummies that will take the value one for clients of the banks that have merged after the merger and zero otherwise. We also control the firm's age given by the difference between year of analysis and the year of incorporation of the firm. We control for profit given by the ratio of profit before tax to total sales.

4 Methodology

4.1 Estimating the Cost of Equity

We consider the daily closing price of the NSE-listed firms during the quarter preceding the merger announcement, i.e., April–June 2018, and also during the quarter April–June 2019, to capture the cost of equity before and after the merger, respectively.

We estimate the market model using a rolling 30 window in the pre-merger quarter and post-merger quarter separately. The firms that did not have at least 30 days closing prices in each of the quarters were dropped from the sample. We consider NIFTY50, which is a value-weighted of 50 securities, as the market index in our specification. We regress the return of the stock during the last 30 days on the return of the market index during the last 30 days given by Eq. (1) and estimate the beta for each firm.

$$r_{it}{}^{k} = \alpha_i{}^{k} + \beta_i{}^{k} r_{mt}{}^{k} + u_{it}{}^{k}; \;\; t = -1, -2, \ldots., -30; k = 2018 \text{ or } 2019 \qquad (1)$$

We consider the average firm-level estimated beta during the April–June 2018 quarter as a measure of systematic risk of the firm in the pre-merger period. Similarly, the average firm-level estimated beta during April–June 2019 is considered as a measure of systematic risk in the post-merger period. Further, we obtain the risk-free rate given the 91-day T-bill rate during the April–June 2018 and for the April–June 2019 quarters from EPWRF India Time Series (EPWRFITS) maintained by EPW Research Foundation, which provides time-series data on various indicators related to the Indian economy. The average 91-day T-Bill rate during the quarter is considered as the measure of risk-free rate for the CAPM model. Finally, the information regarding the expected risk premium for the Indian equity market for

the year 2018 and 2019 were used[1] to calculate the CoE for firm i in period k is estimated using Eq. (2):

$$\text{CoE}_i^k = r_f{}^k + \beta_i{}^k \text{Risk premium}^k; k = 2018 \text{ or } 2019 \quad (2)$$

4.2 Estimating the Cost of Debt

We estimate the cost of debt (CoD) for NSE-listed firms by first assigning synthetic credit rating data based on the interest coverage ratio of the firms. The interest coverage ratio is calculated as EBIT/interest expense (i.e., earnings before interest and tax divided by interest expense) using the annual EBIT and annual interest expense for the fiscal year 2017–2018 and fiscal year 2018–2019. The information on EBIT and interest expense is taken from the CMIE Prowess database, which provides the financial performance of Indian companies. The companies with undefined interest coverage ratio are ignored.

The "synthetic" credit rating is assigned based on the interest coverage ratio range of the firm.[2] The archived dataset available on Aswath Damodaran's website helps in assigning a credit default spread against the synthetic credit rating obtained.[3] The cost of debt is estimated by adding the credit default spread obtained to the average 91-day T-bill rate (r_f^k) during the April 2017–March 2018 and for April 2018–March 2019 from EPWRF India Time Series (EPWRFITS) maintained by EPW Research Foundation. The CoD for firm i in period k is estimated using Eq. (3):

$$\text{CoD}_i^k = r_f{}^k + \text{Default spread}_i^k; k = 2018 \text{ or } 2019 \quad (3)$$

4.3 Estimating the Cost of Capital

We estimate the cost of capital (CoC) using the weighted average of the various sources of capital, debt and common equity, with the weights being the book value of debt to capital and book value of equity to total capital of the firm, respectively. The debt to capital (B/V) and equity to capital ratio (S/V) is taken as of fiscal year ending 2018 and fiscal year ending 2019 from the CMIE Prowess database, the largest database containing the financial performance of Indian companies. The

[1] http://pages.stern.nyu.edu/~adamodar/New_Home_Page/dataarchived.html

[2] http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/ratings.htm

[3] http://pages.stern.nyu.edu/~adamodar/New_Home_Page/dataarchived.html

after-tax cost of debt is calculated by multiplying the corporate tax rate (*tax rate*^{k}) prevalent in India for the given year with the pre-tax cost of debt.

The CoC for firm i in period k is estimated using Eq. (4):

$$\mathrm{CoC}_i^k = \frac{B_i^k}{V_i^k}\mathrm{CoD}_i^k * \left(1 - \text{tax rate}^k\right) + \frac{S_i^k}{V_i^k}\mathrm{CoE}_i^k; \mathrm{k} = 2018 \text{ or } 2019 \quad (4)$$

4.4 Regression Framework

The equation below gives the effect of BoB merger on various costs of raising capital:

$$Y_{it} = \delta_0 + \delta_1 \mathrm{treat}_i * \mathrm{post}_t + \delta_2 \mathrm{treat}_i + \delta_3 \mathrm{post}_t + \mathrm{Industry}_i + e_{it} \quad (5)$$

where Y_{it} is the CoC, CoE, or CoD. The coefficient δ_1 captures whether the cost of raising money has gone up for the borrowers of merger-affected banks after the merger. A positive and significant coefficient would suggest that the average cost of raising capital has increased for the affected firms due to the merger. In our regression framework, we control for industry effects using the 2-digit National Industrial Classification (NIC) codes. In addition to Eq. (3), we also estimate a firm fixed effects model to account for any firm level unobservable factors that may affect the cost of raising capital. The dependent variable is winsorized at the 1 and 99 percentiles, respectively. Further, we report heteroscedasticity and autocorrelation consistent standard errors for all the models.

5 Results

5.1 Univariate Analysis

Table 1 presents the summary of the average cost of raising various forms of capital for firms who were the borrowers of the merger-affected banks (treated) and for the firms that did not have any banking relationship with the merger-affected banks (control). The average CoC was 12.9% during the study period for the NSE-listed firms. We observe that the CoC for the treated firms was greater than the control firms during the period at 5% level of significance. Panel B presents the difference in means between the treated and control firms in the post-merger period. In the post-merger period, CoD, CoE and CoC was higher for the treated firms compared to control firms at 5% level of significance. The univariate summary statistics suggest

Table 1 Summary statistics

	Panel: A		
	All firms	Treated	Control
Cost of capital	0.129	0.133***	0.123
Cost of debt	0.127	0.145***	0.128
Cost of equity	0.119	0.124***	0.118
	Panel B: Post-merger		
		Treated	Control
Cost of capital		0.138***	0.128
Cost of debt		0.151***	0.130
Cost of equity		0.143***	0.131

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

Table 2 Diagnostic checks

	(1)	(2)	(3)
Variables	CoC	CoD	CoE
VIF			
Treat	2.07	2.08	2.57
Post	1.25	1.26	1.09
Treat*post	2.25	2.26	2.04
Profit	1.09	1.07	1.04
Age	1.12	1.14	1.15
Chi-square test statistic	0.26	24.43	1.06
	(0.607)	(0.000)	(0.303)

that the BoB merger may have affected the cost of raising capital for the firms. We explore this possibility further using a regression framework.

Table 1 provides the mean of raising capital and the difference in cost of capital for the treated and control firms in the sample.

5.2 Regression Results

We estimate Eq. (5) using OLS methodology and perform basic diagnostic checks. The variance inflation factor (VIF) values are well below the threshold of 10 and suggest that multicollinearity does not affect our inference. Further, the Breusch-Pagan test statistic is insignificant at a 5% level of significance for regressions with the cost of capital and cost of equity capital as the dependent variable, providing evidence that heteroscedasticity is not a concern of our estimation. However, for the regression with the cost of debt as the dependent variable, we find that the errors are heteroscedastic. We report robust standard errors in all the specifications to alleviate any concerns related to heteroscedasticity and autocorrelation in residuals.

Table 2 below reports the variance inflation factor values and the test statistic value obtained from BP test after OLS regression of cost of capital, cost of equity, and cost of debt on interest variable and other controls.

Table 3 Effect of BoB merger of cost of raising capital

Variables	(1) CoC-no firm controls	(2) CoC-firm controls	(3) CoD-no firm controls	(4) CoD-firm controls	(5) CoE-no firm controls	(6) CoE-firm controls
Treat	−0.003	−0.002	0.018***	0.177***	−0.001	−0.002
	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)
Post	0.000	0.000	0.013***	0.014***	−0.004*	−0.004*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
					(0.000)	(0.000)
Treat*post	***0.010****	***0.010****	***−0.002***	***0.001***	***0.011****	***0.012****
	(0.004)	***(0.004)***	***(0.006)***	***(0.006)***	***(0.005)***	***(0.005)***
Profit		0.000***		0.000***		0.003***
		(0.000)		(0.000)		(0.001)
Age		0.0064*** (0.001)		0.001 (0.002)		0.000* (0.000)
Constant	0.137***	0.114***	0.160***	0.157***	0.183***	0.180***
	(0.026)	(0.027)	(0.033)	(0.033)	(0.020)	(0.020)
Industry FE	Y	Y	Y	Y	Y	Y
Observations	2884	2880	3409	3405	3148	3114
R-squared	0.055	0.066	0.106	0.144	0.052	0.064

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

Table 3 presents the regression output after controlling for the industry-specific factors. Column 1 indicates that the coefficient of the interaction of treat and post dummies is significant at the 5% level of significance. It appears that even after controlling for industry factors, year effect, and differences between treated and control firms, there is a positive impact of the BoB merger on the overall cost of capital of treated firms. Post-merger, the cost of capital of treated firms increased by 1.0%. Controlling for firm factors like age of the firm and profit yield qualitatively similar results (Column 2).

Table 3 below presents the results of regressing cost of raising capital on treat dummy, post dummy, and treat and post dummy interaction after controlling for 2-digit NIC codes and other firm controls. Robust standard errors are reported in parenthesis.

This increase in CoC can be driven by either an increase in CoD or CoE or both. (Patti & Giorgio, 2007; Sapienza, 2002) suggest that bank mergers can adversely affect the borrower's credit availability. Columns 3 and 4 present the results for CoD regression with and without firm controls, respectively. In both the specifications, the coefficient of treat and post dummy interaction variable is insignificant at usual levels of significance. This suggests that in the Indian context, the BoB merger did not have any significant effect on the cost of bank capital for the borrowers of the consolidation-affected banks. This finding is unlike the evidence in developed countries wherein bank mergers are found to have a bearing on cost of bank capital.

Table 4 Effect of BoB merger of cost of raising capital—firm fixed effects model

	(1)	(2)	(3)
Variables	CoC	CoD	CoE
Post	0.001	0.015***	−0.004*
	(0.002)	(0.001)	(0.002)
Treat*Post	**0.009****	**0.011**	***0.010****
	(0.006)	(0.003)	***(0.005)***
Constant	0.128***	0.120***	0.137***
	(0.002)	(0.001)	(0.001)
Firm FE	Y	Y	Y
Observations	2884	3409	3148
R-squared	0.007	0.093	0.004
Number of firms	1535	1796	1638

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

Next, we analyze the effect of the merger on the CoE of the firms (columns 5 and 6). We find that the treated firm's CoE increases in the range of 1.2%–1.3% in the post-merger period. The increase in the CoC is essentially driven by the rise in CoE of the treated firms in our sample. The increase in CoE can be because of two specific reasons. First, the increase in CoE can be due to a change in the capital structure of the treated firms post-merger to adjust for the change in credit availability after the BoB merger. Second, CoE can increase if the investors of the treated firms believe that the merger can reduce the credit availability or the quality of monitoring by the bank. The expected higher risk of investing in the treated firms post-merger can lead to an increase in CoE.

We also estimate the firm fixed-effects model to account for the effect of any firm level unobservable factors (Table 4). The fixed-effect estimator also suggests that the BoB merger increased the CoC for the treated firms (column 1) by 0.9% on average. The higher CoC is driven by CoE (column 3), and there is no effect on the CoD (column 2). Our results are robust to the fixed-effects model specification, suggesting that India's bank merger may not have a short-run effect of CoD of the treated firms; however, it is not costless from the borrower's perspective.

Table 4 below presents the results of regressing cost of raising capital on treat dummy, post dummy, and treat and post dummy interaction after controlling for firm fixed effect. Robust standard errors are reported in parenthesis.

5.2.1 Why Is the Cost of Equity Higher for Treated Firms?

The increase in CoE of the treated firms can be either due change in capital structure or on account of the higher perceived risk of the treated firms. We explicitly test whether the capital structure of the treated firms changed post-merger to understand the channel that affects the CoE. In order to evaluate the effect of BoB merger on the capital structure of the firms, we estimate the following equation:

Table 5 Effect of merger on capital structure

	(1)	(2)	(3)
Variables	Coefficient	*t*-value	*p*-val
Post	−0.131	−1.33	0.183
Treat	0.787	5.350	0.000
Treat*post	***0.145***	***0.70***	***0.483***
Constant	−1.923***	−27.59	0.000
Observations	2471		
R-squared	0.025		

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

$$\ln\left(\frac{D}{E}\right)_{it} = \alpha_0 + \alpha_1 \text{treat}_i * \text{post}_t + \alpha_2 \text{treat}_i + \alpha_3 \text{post}_t + \epsilon_{it} \tag{6}$$

A significant α_1 will provide evidence in favor of the conjecture that the merger had a bearing on the capital structure of the treated firms, which in turn can have an effect on the CoE.

The result reported in Table 5 suggests that the BoB merger did not affect the treated firms' debt-equity ratio as the coefficient of the interaction term is negative and insignificant at 5% level of significance. This suggests that the increase in CoE of the treated firms is plausibly due to the rise in perceived risk of the treated firms on account of the merger of its banker. It is likely that bank consolidation in emerging market economies can have a spillover effect on the equity market by altering the investor's expectation and risk assessment of the firms. The change in investor's perceptions can be due to two underlying reasons. First, post-merger, the managers of the merged banks are likely to be occupied with activities ensuring a smooth transition. This can have an indirect effect on the quality of monitoring of firms by the banker. The threat of poor-quality monitoring in the post-merger period increases the agency cost in emerging markets. The investors will require a higher return as compensation for this increase in agency cost. Second, in the presence of informational asymmetry, the investors of treated firms will attach a higher probability of a fall in credit availability of the treated firms in the post-merger period owing to loan portfolio rationalization. Any reduction in bank capital will increase the financing constraints faced by the treated firms. The increase in the perceived systematic risk of the treated firms in the post-merger period can also lead to a higher cost of equity.

Table 5 below presents the output obtained from regressing logarithm of debt equity ratio on treat dummy, post dummy, and interaction of treat and post dummies after controlling for 2-digit NIC codes. Robust standard errors are reported in parenthesis.

6 Conclusion

This chapter considers the first-ever three-way bank consolidation in India during 2018 and examines the effect of the merger on the bank's borrowers. The firms in India are heavily dependent upon banks for their financing needs, and consolidation in the banking industry is likely to have a short-run effect on the borrowers. Our estimation strategy identifies the borrowers of the merger-affected banks in the pre-merger period and suggests that the average costs of capital for these treated firms have gone up in the year following the merger. However, unlike the evidence in developed countries, the increase in the cost of capital in India is driven by higher cost of equity and the cost of debt remains unaffected. This rise in the cost of equity is not driven by any change in the capital structure of the treated firms in the post-merger period. We attribute the higher cost of equity to the investor's perceived higher risk in the medium run.

Bank mergers can reduce the extent of monitoring of the treated firms in the post-merger period owing to more time being devoted by bank managers to merger-related operational issues. The fear of lower monitoring increases the agency problem in emerging market economies which might translate into a higher cost of equity for the treated firms. Additionally, shareholders may fear that the merger will reduce the credit availability in the medium run, and this, in turn, can adversely affect the investments and growth of the treated firms. The higher probability of reduced credit availability is also likely to show up as an increased cost of equity for the treated firms. Our results suggest that bank consolidation may not be value-neutral from the borrower's perspective and can have real costs in the short run. Further, our study also highlights that the experience of developed countries can't be directly extrapolated to economies with less than efficient financial markets and a weak regulatory environment.

The findings of this chapter have two policy implications. First, in emerging market economies with less than fully developed capital markets, bank mergers can have adverse spillover effects in the equity market. Companies may use good corporate governance and voluntary disclosures to reduce the perceived increase in investor's risk, increasing the COE for the merger-affected firms. Second, our study highlights that bank consolidation may not directly affect the availability of bank capital to firms which is the primary source of capital for firms in emerging markets. Future studies should explore the effect of bank mergers in the context of emerging markets to better understand the cost and benefits of such government policies.

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Does the Effect of Financial Development on Economic Growth Depend on the Real Sector in Sub-Saharan Africa?

Dauda O. Yinusa, Taiwo Akinlo, and Akintoye V. Adejumo

Abstract This study focused on the moderating role of the real sector on the financial development-economic growth nexus using panel data consisting of 38 sub-Saharan African countries for the period 1986–2015. This is necessary because of the potential discontinuities mediating finance-growth nexus that previous studies have not investigated. The study used the generalised method of moment as the estimation technique. The study found that none of the financial development indicators produces a positive effect on economic growth. Likewise, all four measures of the real sector failed to exert a positive impact on economic growth. The system GMM revealed that industrial value-added and agriculture value-added enhanced the effect of financial development on economic growth, while total factor productivity and service value-added failed to enhance the effect of financial development on economic growth. The study concluded that a well-developed real sector is required for the optimum impact of financial development on economic growth.

Keywords Financial development · Economic growth · Real sector · Sub-Saharan Africa · Domestic credit to private sector · Domestic credit by bank · Inflation · Trade openness

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1 Introduction

The importance of financial development in the development of any economy cannot be overstated. The growth of any economy is linked to the development of its financial sector according to Schumpeter (1911). The financial sector, according to Mckinnon (1973) and Shaw (1973), helps to reduce information asymmetry as well as tracking and transaction costs. The financial sector's indispensability in the economy led to a variety of investigations into the relationship between financial development and economic growth. Despite the numerous research (e.g., Afonso & Blanco-Arana, 2018; Ahmad et al., 2018; Bist, 2018; Čižo et al., 2020; Schumpeter, 1911; Sharma, 2020) that has looked at the relationship between economic growth and financial development, there is no consensus on the subject. As a result, the relationship between economic growth and financial development is constantly re-evaluated as new ideas, datasets, and empirical tools become available.

Studies claiming a detrimental link between financial development and economic growth have increased in recent years, notably following the global financial crisis. Allen, Allen et al. (2009), Cecchetti and Kharroubi (2012), Allen et al. (2014), and Adeniyi et al. (2015), for example, found an adverse association between financial development and economic growth. The negative impact of financial development on economic growth has been attributed to a variety of factors. Some authors, such as Murphy et al. (1991), Santomero and Seater (2000), and Philippon (2010), have stated that a fast-growing financial sector generates high rents and attracts funds that should be shared among the many sectors of the economy, but that when the funds are allocated inefficiently, feasible growth rates may not be achieved. Cecchetti and Kharroubi (2012) backed this up by stating that industries compete with other sectors in the economy for cash and physical capital in the form of computers, buildings, and skilled personnel. Furthermore, when practically all of these resources are directed toward the financial sector's expansion and growth, other sectors would suffer and stagnate due to a shortage of funding, making economic progress difficult because it opposes the balanced growth theory. As a result, for a stronger impact on economic growth, the financial sector is expected to increase in tandem with other sectors of the economy. All sectors of the economy must develop at the same rate, according to the balanced growth theory. The real and financial sectors, in particular, should grow at similar rates. When either a sector increases excessively, it will have a negative influence on total output. To prevent the build-up of financial instability, the sectors which use financial services have to develop adequately fast to keep the requirement for financial funds.

In line with the theoretical suggestion that financial development needs to be considered in conjunction with other sectors that govern growth, some studies have started considering intermediary variables between financial development and economic growth. For example, Ibrahim and Alagidede (2018) used per capita income and human capital as the link variables between financial development and economic growth. Ductor and Grechyna (2015) used the real sector as the intervention variable between financial development and economic growth. Institutional

investors are used as an intermediary variable by Davis (2004) and Ruiz-Vergara (2017). Some studies like Demetriades and Law (2006), Ahlin and Pang (2008), Anwar and Cooray (2012), Law et al. (2013), and Effiong (2015) considered institutional quality as the intermediary variables.

According to Beck and Cull (2013), the financial sector in sub-Saharan Africa (SSA) has undergone several changes in previous years. To increase the efficiency of the financial sector, numerous reforms and financial liberalisation have been enacted. Most countries in sub-Saharan Africa, for example, liberalised their interest rates in an attempt to stabilise the financial sector. To put it another way, they switched from a fixed controlled regime to a market-determined system to increase savings mobilisation and credit disbursement. Also abolished were loan ceilings and preferred interest rates for specific sectors of the economy, allowing financial services to flow to the most productive sectors. The government-initiated reforms also include the privatisation of state-owned banks and other financial institutions to eliminate administrative shortcomings, political involvement, and rent-seeking activities. Although the financial system is more stable and deeper, and the incidence of systemic banking crises has decreased as a result of the reforms, the SSA region is still dominated by high unemployment, a decline in real sector output, and the collapse of many manufacturing and industrial organisations. The real sector, according to Sanusi (2011), is where economic agents manufacture products and services using raw materials and factors of production. However, because of a lack of investment and efficiency, the real sector output in the SSA region has decreased.

This research adds to the body of knowledge in the following ways. First, this research looks at the direct effect of financial development and real sector on economic growth. Second, the study examines the joint effect of financial development and real sector on economic growth. This will allow us to see if the real sector boosts financial development's impact on economic growth. Unlike Ductor and Grechyna (2015), this study proxies the real sector by industrial value-added, total factor productivity, agriculture value-added, and service value-added. Using these proxies of the real sector is not common in the previous studies.

Following this Sect. 1 is Sect. 2 which provides a brief review of the literature. Section 3 presents the model specification and data descriptions and sources. We provide empirical results in Sect. 4. Section 5 presents the discussion of the study. The conclusion is presented in Sect. 6.

2 Literature Review

In this section, we classified our review into three groups. In the first group, we review some of the studies that found a positive relationship between financial development and economic growth. In the second group, we review a few studies that found a negative relationship between financial development and economic growth. In the third group, we review the studies that considered the intermediaries between financial development and economic growth.

We begin our review with research that found a positive link between financial development and economic growth. Since Schumpeter (1911) established a positive association between financial development and economic growth, a number of other studies have found that financial development has a positive effect on economic growth. King and Levine (1993) in a study consisted of 77 countries throw weight behind positive associations between finance and growth as the study showed that rapid current and future rate of economic growth is highly connected with a stronger financial development. Beck and Levine (2004) in a study that consists of 40 countries and covered the period 1976–1998 revealed a positive connection between banking development and economic growth and as well between stock market development and economic growth. Beck et al. (2000) also indicated a positive link between financial development and economic growth from a study that comprises 74 countries of both developed and developing nations, while the data spanned through 1960–1995. Gertler and Rose (1994) confirmed a positive link between banking intermediation and the real economy in a sample comprised of 60 developing countries. Using a panel Granger-causality test and the advanced dynamic common correlated estimator (DCCE) for the period 1980–2020, Nguyen et al. (2021) found a positive impact of financial development on economic growth and that the relationship is linear in emerging markets. Ahmed et al. (2022) employed fully modified ordinary least squares (FMOLS) and dynamic ordinary least squares (DOLS) and found a positive effect of financial development on economic growth in the South Asian economies over the period 2000–2018.

The second group found an inverse connection between financial development and economic growth. Arcand et al. (2012) reported that in high-income countries, the relationship between finance and growth becomes negative when credit to the private sector reaches 100% of GDP. Kaminsky and Reinhart (1999) examined the evolution of fundamentals in the run-up to currency and banking problems and show that financial crises follow economic recessions, credit growth, rising fiscal deficits, and currency overvaluation. Samargandi et al. (2015) used panel data consisting of 52 middle-income countries to examine the relationship between financial development and economic growth, and the study found a negative relationship in upper-middle-income countries. Deidda and Fattouh (2002) reported a non-linear and possibly non-monotonic relationship between financial development and economic growth. The study also presented an insignificant relationship between financial development and economic growth in low-income countries when applying the threshold regression model to King and Levine's dataset. Adeniyi et al. (2015) indicated a negative effect of financial development on economic growth in Nigeria when using annual data from 1960 to 2010, but the sign was reversed when the squared terms of financial development are included in the model. Cecchetti and Kharroubi (2012) investigated the effect of financial development on the growth of aggregate productivity. First, the study reported that above a certain level, financial development becomes an obstacle to growth in a sample of developed and emerging economies. Second, they indicated that the rapid growth of the financial sector is an obstacle to aggregate productivity growth in advanced economies.

Regarding the studies that considered the intermediaries between financial development and economic growth, Ibrahim and Alagidede (2018) considered if the level of per capita income of a country and human capital could influence the finance and economic growth relationship. They draw their sample from 29 sub-Saharan countries, while the study spanned from 1980 to 2014. The results of threshold regression indicate that below the threshold level, finance is indifferent to growth, while above the threshold level, finance produces a positive and significant impact on growth. The study concluded that both the level of income and human capital are essential to growth like finance does. Ductor and Grechyna (2015) used the real sector as the intermediary variable between financial development and economic growth in a study that contains 101 countries from developed and developing countries. The study found that the impact of financial development on economic growth turns negative when private credit is growing rapidly without corresponding growth in the real output. Aluko and Aluko and Ibrahim (2020) used the level of institutions as an intermediate variable to investigate the link between financial development and economic growth in sub-Saharan Africa. The study found that financial development does not significantly support economic growth below the threshold level when institutional quality from the International Country Risk Guide is used as the threshold variable. Financial development, on the other hand, promotes economic growth above the threshold level. When the World Governance Indicators' institutional quality is employed as a threshold variable, the study found a significant effect of financial development, regardless of whether a country is below or above the threshold level. Bandura and Bandura and Dzingirai (2019) used a 5-year averaged dataset from 1982 to 2016 to study the relationship between financial development and economic growth in terms of institutional quality in 27 sub-Saharan African countries. The findings revealed a U-shaped relationship between financial development and growth, implying that more (or less) finance accelerates (or retards) growth. The study also found that the impact of financial development on economic growth is boosted by institutional quality.

3 Methods

3.1 Model Specification

In an attempt to examine the moderating effect of the real sector on the relationship between financial development and economic growth in sub-Saharan Africa over the period 1986–2015, this study's selection of countries and periods is based on the relative availability of data. Civil war erupted in some countries in sub-Saharan Africa at one point or another, rendering data for the affected period inaccessible. This period was also chosen because it coincided with a period of instability and decline in the real and financial sectors in sub-Saharan African countries. The economic downturn during this time, particularly in the mid-1980s, resulted in bank failures in numerous sub-Saharan African (SSA) countries (Chea, 2011).

This study adopts the normal typical cross-country equation, which is specified as follows:

$$y_{it} = \alpha_1 y_{it-1} + \beta_1 \mathrm{FIN}_{it} + \beta_2 \mathrm{RSE}_{it} + X'_{it} + \mu_i + \epsilon_{it} \quad (1)$$

From Eq. (1), y_{it} is the real GDP per capita growth for country i in period t, y_{it-1} represents lagged GDP per capita growth, FIN is the financial development, and RSE indicates real sector which is proxied by industrial value-added, agriculture value-added, total factor productivity, and service value-added. X'_{it} stands for control variables influencing economic growth, μ_i represents the unobservable country-specific effect, and ϵ_{it} is the error term.

Since the objective of this study is to examine if the effect of financial development on economic growth depends on the real sector, we test this hypothesis by adding an interaction term between financial development and real sector to the standard cross-country equation specified in Eq. 1. In a more detailed specification, the econometric model to be estimated according to the objective of this study is.

$$\begin{aligned} y_{it} = {} & \alpha_1 y_{it-1} + \beta_1 \mathrm{FIN}_{it} + \beta_2 \mathrm{RSE}_{it} + \beta_3 (\mathrm{FIN} * \mathrm{RSE})_{it} + \beta_4 \mathrm{PHY}_{it} + \beta_5 \mathrm{GOV}_{it} \\ & + \beta_6 \mathrm{TRADE}_{it} + \beta_7 \mathrm{COR}_{it} + \beta_8 \mathrm{INF}_{it} + \mu_i + \epsilon_{it} \end{aligned} \quad (2)$$

where FIN $*$ RSE represents the interaction of financial development and the real sector, PHY is the physical capital, GOV indicates government expenditure, TRADE implies trade openness, COR represents corruption, and INF stands for inflation. All the variables are expressed in logarithm form. Due to the endogeneity issue between the dependent variable and the explanatory variables, using the traditional methods like fixed effects and random effects will produce inconsistent estimates. However, to solve the problem of endogeneity, Arellano and Bond (1991) developed difference GMM which uses instrumental variables to deduce the generalised method of moments (GMM) of corresponding moment conditions. According to Bond et al. (2001), the difference GMM has a shortcoming as it may suffer a severe "weak instruments" problem and produce inaccurate estimates in the presence of finite samples. As a result, Arellano and Bover (1995) and Blundell and Bond (1998) proffered a solution to this problem by developing a system GMM estimator which combines additional moment restrictions with those in Arellano and Bond (1991).

The system GMM is capable of addressing issues like heterogeneity problems, omitted variable bias, measurement error, and potential endogeneity problems which static methods could not address in growth models (Bond et al., 2001). In this study, we used two-step GMM as Aluko and Aluko and Ajayi (2018) stated that in the presence of heteroskedasticity, the two-step system GMM estimator presents more asymptotic efficient estimates than one-step system GMM estimator. Teixeira and Queirós (2016) indicated that the two-step GMM is more suitable for the model that has a larger number of countries and a shorter period.

3.2 Data and Variable Description

In this section, we describe the data we use in our estimation. The dependent variable is the logarithm of GDP per capita growth which is used to measure economic growth. Its measure is based on a constant value of 2010 US dollars. Other studies like Samargandi et al. (2015), Adeniyi et al. (2015), and Ductor and Grechyna (2015) used GDP per capita growth to measure economic growth. Data on GDP per capita growth is obtained from World Development Indicator.

Most of the previous studies proxied the real sector by industrial value-added (e.g. Adeusi and Aluko 2015; Akinlo et al., 2021; Ductor & Grechyna, 2015, and Ibrahim & Alagidede, 2018). However, to provide a robust result, we consider other indicators of the real sector in addition to industrial value-added. These include agriculture value-added, total factor productivity, and service value-added. Industrial value-added (% GDP)—This is the value-added in mining, manufacturing, construction, electricity, water, and gas. Agriculture value-added (% GDP)—This includes forestry, hunting, and fishing as well as cultivation of crops and livestock production. Value-added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. Total factor productivity (TFP)—This is the total factor productivity (TFP) level, computed with output-side real GDP, capital stock, labour input data, and the share of labour income of employees and self-employed workers in GDP. Service value-added (% GDP)—This includes value-added in wholesale and retail trade (including hotels and restaurants), transport, and government, financial, professional, and personal services such as education, health care, and real estate services. The industrial value-added, agriculture value-added, and service value-added are from World Development Indicator. Total factor productivity is obtained from the Penn World Table database (Feenstra et al., 2015). Recent studies like Meniago and Asongu (2019) and Asongu (2019) used total factor productivity to proxy productivity.

Financial development is measured by domestic credit to the private sector and domestic credit by banks. Domestic credit to private sector as a percentage of GDP—It is the financial resources made available to the private sector. Domestic credit by banks as a percentage of GDP—It refers to financial resources made available by the banking sector.

Physical capital is proxied by gross capital formation as a percentage of GDP. We expect physical capital to have positive impact on economic growth. Government expenditure (% of GDP)—This is measured by general government final consumption expenditure. The coefficient of government expenditure can be negative or positive depending on the direction of government spending. Trade openness—This is calculated by the sum of imports and exports divided by gross domestic product. It provides a wider market for industries to export their products. Based on this, the coefficient of trade openness is expected to be positive. Inflation is the consumer price index. Inflation reduces the value of savings and, through this channel, aggravates informational friction distressing the financial system. So, the coefficient of inflation is expected to be negative. Many studies have shown that

Table 1 Descriptive statistics

	Mean	Std. dev.	Min	Max
GDP per capita growth	1.483	7.388	−47.722	141.642
Industrial value-added	1.382	0.207	0.414	1.926
Total factor productivity	0.568	0.270	0.105	1.738
Agriculture value-added	1.285	0.366	−0.049	1.788
Service value-added	1.632	0.113	1.095	1.887
Domestic credit to private sector	1.072	0.384	0.703	2.205
Domestic credit by banks	1.048	0.372	0.812	2.026
Physical capital	1.255	0.245	−0.533	2.341
Government spending	1.138	0.185	0.311	1.806
Inflation	0.906	0.642	−1.436	4.388
Trade openness	1.799	0.221	1.045	2.726
Corruption	0.738	0.250	0	1.041

Source: Authors computation

institution quality is crucial to economic growth. In line with this, we include corruption as a measure of institutional quality in our model. Corruption is more concerned with actual or potential corruption in the form of excessive patronage, nepotism, job reservations, 'favour-for-favours', secret party funding, and suspiciously close ties between politics and business. All the data on the control variables except corruption are sourced from World Development Indicators (WDIs) published by the World Bank. Data on corruption is obtained from the International Country Risk Guide (ICRG). Corruption from the International Country Risk Guide is rated between 0 and 6. A score of 6 signifies a low level of corruption, while a low score of 0 indicates a high level of corruption. We present the summary of statistics of the variables in Table 1. The list of the countries included in the study is presented in the appendix.

4 Empirical Results

To evaluate whether the effect of financial development on economic growth depends on the real sector, this study considered the complementary effect of financial development and the real sector using panel regression analysis which covered the period 1986–2015. For robustness issues, we employ two indicators of financial development, while the real sector is proxied by industrial value-added, total factor productivity, agriculture value-added, and service value-added.

In Table 2, we used domestic credit to private sector as a financial development indicator. The table consists of four models. In the first model, the real sector is proxied by industrial value-added. In the second model, the real sector is proxied by total factor productivity. The real sector is proxied by agriculture value-added and service value-added in the third model and fourth models, respectively. Each of the

Table 2 Domestic credit to private sector, real sector, and economic growth

	Mode 1 Industrial value-added	Mode 2 Total factor productivity	Mode 3 Agriculture value-added	Mode 4 Service value-added
Lagged GDP per capita growth	0.227*** (0.000)	0.278** (0.012)	0.125(0.327)	0.454*** (0.000)
Domestic credit to private sector	−15.065* (0.061)	−3.444 (0.690)	−29.630*** (0.000)	−49.872*** (0.004)
Industrial value-added	−4.483 (0.110)			
Total factor productivity		−7.725 (0.743)		
Agriculture value-added			−25.594*** (0.001)	
Service value-added				−29.143*** (0.000)
Domestic credit to private sector*Industrial value-added	10.409* (0.062)			
Domestic credit to private sector*Total factor productivity		−4.289 (0.770)		
Domestic credit to private sector* Agriculture value-added			17.210*** (0.002)	
Domestic credit to private sector*Service value-added				26.099*** (0.007)
Physical capital	11.059*** (0.000)	19.650*** (0.000)	23.669*** (0.000)	4.133** (0.014)
Government spending	−6.979 (0.164)	−21.366*** (0.000)	−7.247 (0.130)	−2.199 (0.630)
Inflation	0.925 (0.144)	−0.436 (0.764)	−1.945* (0.080)	−0.951 (0.434)
Trade openness	2.630 (0.212)	8.286* (0.092)	10.489** (0.048)	25.279*** (0.000)
Corruption	−5.743* (0.055)	−10.761** (0.019)	1.232(0.605)	12.343*** (0.000)
AR(1) p-value	0.010	0.024	0.029	0.009
AR(2) p-value	0.247	0.332	0.561	0.117
No of instrument	28	28	26	26
Hansen p-value	0.306	0.738	0.202	0.230
Observations	579	659	657	638
No of countries	38	38	38	38

Notes: All the variables are in logs except GDP per capita growth. The p-values for system GMM estimates are in brackets. ***, **, and * denote the significance of the individual coefficients at 1%, 5%, and 10% levels, respectively. The Hansen test is for the over-identifying restrictions. AR(1) and AR(2) are the tests for first and second-order autocorrelation, respectively

models reports the direct effect of domestic credit to private sectors, the real sector indicators, and their interaction on economic growth with the other determinants of economic growth.

In models 1, 3, and 4, domestic credit to the private sector has a negative and significant impact on economic growth, whereas it has an insignificant negative effect in model 2. In model 1, the effect of industrial value-added on economic growth is insignificant negative. The insignificant impact of industrial value-added on economic growth in sub-Saharan Africa is unsurprising, given that the majority of the region's industries are small and focused on primary or extractive products with little or no impact on economic growth due to limited linkages with other sectors of the economy. Furthermore, the industrial sector in sub-Saharan Africa is defined by low technology, since medium and high technology structures, which are linked with substantial revenues, large volumes of output, dynamism, and quick economic expansion, are absent. In model 2, total factor productivity has no effect on economic growth. In models 3 and 4, agriculture value-added and service value-added failed to boost economic growth.

In models 1, 3, and 4, the coefficients of the interactive term are positive and significant. This implies that industrial value-added, agriculture value-added, and service value-added enhance the effect of domestic credit to the private sector on economic growth. This result is expected because it is consistent with our prior theoretical predictions. This finding suggests that all the proxies of the real sector except total factor productivity boost the effect of financial development on economic growth.

Physical capital has a positive coefficient in all the models and is statistically significant. Government spending has a negative coefficient in all models but is only significant in model 2. Inflation harms economic growth as its coefficient is negative and significant in models 2 and 3. Trade openness significantly contributes to economic growth in models 2, 3, and 4. Corruption produces a mixed result on economic growth as its coefficient is negative and significant in models 1 and 3, while it is positive and significant in model 4. Based on the diagnostic tests, the system GMM estimation performs very well. The test for the first-order autocorrelation (AR(1)) in the models indicates that the null hypothesis of the absence of the first-order autocorrelation is rejected in all the models. On the contrary, the test of second-order autocorrelation (AR(2)) indicates the absence of second-order autocorrelation in all the estimations as the null of no second-order autocorrelation is not rejected. The p-value of the Hansen test is not significant which implies that it supports the validity of the instrument used.

Domestic credit by bank is used as a proxy for financial development in Table 3. The domestic credit by banks is harmful to economic growth as its coefficient is negative and significant in all the models. The impact of industrial value-added, agriculture value-added, and service value-added on economic growth is significant negative. The negative effect of agriculture value-added is not expected given that the agriculture sector employs the majority of the people in sub-Saharan Africa. However, agriculture's contribution to GDP has been declining in sub-Saharan Africa over the years. Agricultural value-added, for example, accounted for 16%

Table 3 Domestic credit by banks, real sector, and economic growth

	Mode 1 Industrial value-added	Mode 2 Total factor productivity	Mode 3 Agriculture value-added	Mode 4 Service value-added
Lagged GDP per capita growth	0.0221*** (0.000)	0.334*** (0.000)	0.050*** (0.000)	−0.100 (0.937)
Domestic credit by banks	−19.260** (0.023)	−17.017** (0.041)	−26.694** (0.012)	−7.283*** (0.001)
Industrial value-added	−17.310** (0.043)			
Total factor productivity		−25.488 (0.127)		
Agriculture value-added			−18.142*** (0.006)	
Service value-added				−22.628* (0.052)
Domestic credit by banks *Industrial value-added	12.124** (0.043)			
Domestic credit by banks *Total factor productivity		18.843(0.205)		
Domestic credit by banks * Agriculture value-added			17.206** (0.030)	
Domestic credit by banks *Service value-added				39.410*** (0.001)
Physical capital	11.243*** (0.000)	−1.697 (0.447)	0.883(0.583)	9.904*** (0.000)
Government spending	−6.095 (0.246)	−20.091*** (0.000)	−5.198 (0.274)	−3.910 (0.599)
Inflation	1.334* (0.058)	−0.008 (0.996)	−0.786 (0.465)	0.628 (0.662)
Trade openness	1.961(0.566)	11.623** (0.012)	16.222*** (0.000)	−0.136 (0.987)
Corruption	−4.915*** (0.005)	−11.599** (0.012)	6.340*** (0.005)	−7.206* (0.068)
AR(1)	0.008	0.023	0.005	0.030
AR(2)	0.222	0.251	0.120	0.632
No of instrument	28	28	26	26
Hansen p-value	0.309	0.763	0.705	0.496
Observations	581	656	654	635
No of countries	38	38	38	38

Notes: All the variables are in logs except GDP per capita growth. The p-values for system GMM estimates are in brackets. ***, **, and * denote the significance of the individual coefficients at 1%, 5%, and 10% levels, respectively. The Hansen test is for the over-identifying restrictions. AR(1) and AR(2) are the tests for first and second-order autocorrelation, respectively

of overall GDP from 2000 to 2005, while it accounted for 17.73% of GDP between 2011 and 2015. The agricultural sector has suffered from neglect, a lack of investment, and the use of old technologies, all of which have harmed the sector's production.

On the interactive term, only total factor productivity as proxies of the real sector fails to significantly enhance the effect of domestic credit by bank on economic growth. This implies that other indicators of the real sector boost economic growth by complementing domestic credit by bank.

Physical capital significantly contributes to economic growth in sub-Saharan Africa in models 1 and 4 but has no effect on economic growth in models 2 and 3. Government spending has a detrimental effect on economic growth in model 2, while it has no effect on economic growth in other models. Inflation has a positive and significant coefficient in model 1, whereas in other models, it is insignificant. Trade openness significantly contributes to economic growth as its coefficient is positive and significant in models 2 and 3. The AR(1) and AR(2) tests show that our estimation is valid as it meets the required condition. The validity of estimation requires the first-order autocorrelation to be present and for higher-order autocorrelation to be absent. The Hansen test showed that the instrument used in the estimations is appropriate as the Hansen p-value is insignificant.

5 Discussion of Findings

The two financial development indicators used has a negative impact on economic growth. Studies (e.g. Adeniyi et al., 2015; Akinlo, 2021; Akinlo et al., 2021; Allen et al., 2009; Arcand et al., 2012; Cecchetti & Kharroubi, 2012; Deidda & Fattouh, 2002; Manganelli & Popov, 2013; Samargandi et al., 2015) also found a negative relationship between financial development and economic growth.

Surprisingly, none of the four real sector indicators contributed to economic growth. As a result of the poor performance of the industrial and agricultural sectors, the region's real sector production has fallen over time. Agriculture, for example, only accounts for 15% of total GDP. The share of industrial value-added in GDP has been declining on average. The industrial sector in sub-Saharan Africa is growing at a slower rate than the rest of the world, according to the African Growth Initiative (2018). Total factor productivity in the region has underperformed. According to Hussien (2016), the region's total factor production performance is poor, and it ranks last among the regions. Some studies have connected low total factor productivity to poor institutional quality, trade restrictions, and a shortage of credit to the private sector.

All the proxies of the real sector significantly enhance the impact of financial development on economic growth except total factor productivity. This finding is expected, given it is in line with theoretical studies. This shows that industrial value-added, agricultural value-added, and service value-added enhance the growth impact of financial development. This shows that a well-developed real sector can boost

financial development's impact on economic growth. By allowing financial institutions to distribute funds to the most productive sectors of the economy, the real sector encourages effective fund allocation in the financial sector. The distribution of funds to the real sector will enhance productivity and, as a result, encourage economic growth. The development of the real sector will raise real sector investors' demand for financial resources to take advantage of new opportunities, resulting in increased employment, real sector output, and overall growth. Likewise, when innovation causes an expansion of the financial sector and there is an increase in demand for funds by the productive sector of the economy, it will decrease the possibility of financial institutions' funding of risky investments, bank runs, or financial crises.

Physical capital has a positive and significant impact on economic growth in sub-Saharan Africa. This finding is in line with the findings of Pablo-Romero and Sánchez-Braza (2015), Garzarelli and Limam (2019), and Akinlo and Oyeleke (2020). This finding emphasises the significance of physical capital in economic growth. According to Garzarelli and Limam (2019), physical capital is the primary driver of economic growth in the sub-Saharan African region. Further resources diverted from consumption to infrastructure development could raise the impact of physical capital on economic growth even more. Infrastructure, such as good roads, energy, and health facilities, will help the region's economy grow faster. Inflation has a negative influence on economic growth in sub-Saharan Africa. This is in line with Kasidi and Mwakanemela (2013) and Mandeya and Sin-Yu Ho (2021). According to Gokal and Hanif (2004), excessive inflation combined with greater price unpredictability can have a negative influence on economic growth by creating uncertainty about the future profitability of investment projects. According to them, this leads to more cautious investment choices than would otherwise be the case, resulting in lower levels of investment and economic growth. In addition, inflation may also reduce a country's international competitiveness, by making its exports relatively more expensive, thus impacting the balance of payments negatively. Several sub-Sahara African countries have been unable to keep the level of inflation low over the years successfully.

Trade openness has a beneficial and significant impact on economic growth, which is consistent with Kong et al. (2021) and Oloyede et al. (2021). According to studies by Barro and Sala-i-Martin (1997) and Almeida and Fernandes (2008), increasing trade fosters the transmission of knowledge and technology through the direct import of high-tech commodities, which leads to economic growth. Trade openness, according to Grossman and Helpman (1991), enables the transmission of new technologies, technical advancement, and productivity enhancement. By enacting effective trade liberalisation policies, sub-Sahara African countries can still profit more from trade openness. This study could not conclude on the effect of corruption on economic growth in sub-Saharan Africa. However, the effectiveness of public investment and the availability of infrastructure are both hampered by corruption. It also limits investment in the economy since investors are aware that

officials will seek a bribe or a portion of the return from their venture, making them hesitant to invest. According to Lambsdorff (2003), corruption leads to the misallocation of capital goods because substantial side payments and minimal detection risks are favoured over projects that benefit the general public.

6 Conclusions and Implications of Findings

This study focused on the intermediary role of the real sector in the relationship between financial development and economic growth. The analysis includes 38 sub-Saharan African countries and spans the years 1986 to 2015. We employ two indicators to measure financial development for sufficient evidence and robust findings. Similarly, we use four indicators to measure the real sector. We use a two-step system GMM for the estimation of the results.

From the study, the system GMM results indicate that industrial value-added, agriculture value-added, and service value-added enhance the impact of financial development on economic growth. Also, the study found that financial development and the real sector have a negative effect on economic growth. Some major conclusions can be derived from these findings. First, financial development does not have a beneficial impact on growth on its own, but it does have a significant impact on economic growth via the real sector. This demonstrates that the real sector is vital not only for economic growth but also for the growth impact of financial development. As a result, the real sector acts as a good conduit for the development of the financial sector in sub-Saharan Africa. This highlights the necessity for policymakers in sub-Saharan Africa to implement policies that will secure the real rector's development and expansion. Second, there must be a balance of growth between the financial and real sectors, because any disparity in growth between the two will restrict their impact on economic growth. The government must ensure that developmental policies are geared toward the growth of both the financial and real sectors. This means that decision-makers must consider the development of the real sector, while they consider the potential benefits of financial sector development. The real sector can be improved by providing infrastructure amenities that minimise production costs. Due to a lack of infrastructure, businesses must incur additional costs, resulting in a high price to meet their production costs and stay in business. To protect local companies from unhealthy competition from foreign products, the government should reassess its trade policy with industrialised countries. Industrial products that can be produced locally should be discouraged from being imported. In the real industry, massive investment combined with good policies is required. Inadequate investment in the real sector adds to the sector's poor performance.

Appendix

Table A1 List of the selected SSA countries

Sudan	Burundi	Benin	Namibia
Botswana	Zimbabwe	Sierra Leone	Togo
Kenya	Burkina Faso	Cameroon	
Madagascar	Cote d'Ivoire	Central African. Rep	
Malawi	Gambia	Chad	
Mauritius	Ghana	Congo, Dem. Rep	
Mozambique	Guinea	Congo, Rep	
Rwanda	Guinea-Bissau	Equatorial Guinea	
Seychelles	Mali	Gabon	
Tanzania	Niger	South Africa	
Uganda	Nigeria	Swaziland	
Zambia	Senegal	Angola	

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Financial Sector Reforms and the Significance to Banking Sector in Tanzania

Khadijah J. Kishimba, Joseph O. Akande, and Paul-Francois Muzindutsi

Abstract The predominance of the banking sector amid the reforms made on the entire financial sector owes to the initial existence of the banks as well as the nascent growth of the other financial sector players. This study undertook an assessment of the Tanzania banking sector to observe the notable contribution of the reforms to the sector in Tanzania through review of extant literature, documentaries, and analyses via descriptive statistics. The review found evidence that suggest that the reforms made substantial impact on the development of the banking sector which forms the systemic component of the financial sector. This was supported by existance of prudent legal and regulatory as well as supervisory frameworks to ensure the stability of the financial system and economy at large. Conversely, the review notes that the substantial functioning of the banking sector largely depends on the effective functioning of the category of commercial banks that is largely dominant. However, the observed performance comforts as banks denote adequate capital positions, liquidly position, as well as contained asset quality for the past 10 years.

Keywords Banking sector · Financial sector · Reforms · Financial stability

1 Introduction

Financial sector is an engine for the development of any economy; therefore assessing the developments, structures, composition, as well as their contribution is very important. The financial sector is the composition of entities that provide financial intermediation services for the economy, including banks and other

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financial institutions such as mutual funds, credit unions, pension funds, and insurance companies (Ouanes & Thakur, 1997). In addition, a study by Alexander and Baden (2000) narrates that Organisation for Economic Co-operation and Development (OECD) defines the financial sector as "the set of institutions, instruments, and the regulatory framework that permit transactions to be made by incurring and settling debts; that is, by extending credit."

Generally, the financial sector's significant functions are a value exchange, intermediation, risk transfer, as well as liquidity, which supports the functioning of other industry, hence stimulating economic growth and poverty reduction (Australia, 2014; Fethi & Katircioglu, 2015; Herring & Santomero, 1995; Svilokos et al., 2019). Moreover, individuals could provide these functions, however, having structured institutions consider informational asymmetries that arise in financial transactions, therefore requiring particular supporting abilities to enable the financial sector to operate smoothly.

Tanzania has a blended financial sector, undergoing expansion in asset growth, entry of new entities in the market, and contribution to the economy. Therefore, an effective and efficient regulatory environment ensures the stability of the sector. The Tanzania Masterplan clearly stated that the Tanzania financial sector comprises banking and non-banking sub-sectors, including social security schemes, microfinance, insurance, and capital markets (URT, 2020). Therefore, before assessing the banking sector, it is imperative to understand the financial sector since the banking sector does not operate in isolation from the other financial sectors.

Financial sector is not a stand-alone agenda that rather goes hand in hand with the reforms that occurred aiming at increasing inclusive and economic growth of the country. Despite the efforts in reforms in Tanzania, the banking sector continues to dominate accounting for 70% of the financial sector assets (BOT, 2020a).

Therefore, this chapter intends to uncover the milestones observed in the banking sector by first of all assessing and reviewing the financial sector reforms, financial sector types and composition, as well as domestic economy. The chapter will therefore concentrate on evaluating the banking sector in terms of evolution, regulatory developments, types, ownership, sector composition, and assets.

2 Financial Sector Reforms

Financial sector reforms have an amplified impact on the economy, as markets widen and interlink, therefore creating a supportive environment for economic development. Khan and Sundararajan (1991) state that financial sector reforms are policy measures designed to de-regulate the financial system and transform its structure into a liberalized market-oriented system within an appropriate regulatory framework. In addition, a study by Okeke (2007) also states that reforms are deliberate actions by the government to fast-track a process to achieve the desired objective and establish a movement toward a friendlier, market-oriented economy that will be all-inclusive.

Most of the financial sector reforms consider a particular sector that is significant to enhance contribution to economic growth and increase coverage, access, and flexibility to support trade in respective economies using banking systems, given the significance in the market for developing economies (Asamoah, 2008; Bansal, 2015; Eta & Anabori, 2015; Yadav, 2016). The efforts undertaken in the reforms were to fill the gap on the lack of prudent regulations and supervision; nascent financial markets; informal financing; access to funding; allocation of credit to various activities; and economic sectors.

In that context, the Tanzanian economy has undergone several reforms since early 1991, including the first-generation reforms, which focused on the legal and regulatory environment. The reforms targeted the banks and capital market participation that allowed foreign participation to stimulate competition and economic activities (Nguling'wa Balele et al., 2018; URT, 2020). Despite the benefits ripped in the first-generation reform, access to finance was still a challenge.

Therefore, in 2006, the second-generation reform aimed to complement the first reform by concentrating on inclusive growth and services, including the banking, social security, insurance, and capital markets. In light of this, several policies were to be reviewed, leading to an increase in the entry of financial players, which stimulated the economy's growth (URT, 2020). According to Nguling'wa Balele et al. (2018) and URT (2020), these developments have been transformative to the financial sector, encouraged inclusive growth, and increased access to finance, which fostered innovative products in the market.

The reforms undertook in Tanzania over three decades, supported with a favorable macroeconomic environment, have resulted in the emergence of robust and efficient payment systems, inclusive banking sector, capital market, insurance, and social security schemes (Fund, 2018; URT, 2020). Assessing the financial sector composition and development in line with the reforms substantially adds to the significance of the reforms in the economic development of a country. It is for this context the urge to decompose the financial sector and provide an overview of the developments that occurred in each sector from the time when the sectors started to exist.

2.1 Banking Sub-sector

Babu (2015) narrates that a bank is a financial institution and a financial intermediary that accepts deposits and channels those deposits into lending activities, either directly or through capital markets. Like many developing countries, the Tanzanian banking sub-sector dominants the financial sector, accounting for more than 70.0% of the total assets (BOT, 2020a) having a significant contribution to the economic growth of Tanzania. The existence of several acts, including BOT Act of 2006; Banking and Financial Institutions Act, Cap.342; Foreign Exchange Act of 1992; and National Payment System Act of 2015, provide powers to the Bank of Tanzania to supervise and regulate banking business, payment systems, and foreign exchange

business. In Tanzania, the banking sector has a total of 46 banks that include (35) commercial banks, (4) microfinance banks, (5) community banks, and (2) development financial institutions (BOT, 2020a).

2.2 Microfinance Sub-sector

The financing gap for the individuals due to lack of collateral guarantees has failed to be fulfilled by commercial banks; therefore, the existence of microfinance sub-sector in developing economies has been very significant in supporting economic growth through credit extension (Gutierrez-Nieto et al., 2007; Zohir & Matin, 2004).

Microfinance theory relates to the Grameen Bank of Bangladesh in the 1980s, which focused on assisting the poor to access financial services through the provision of loans, savings, and other essential financial services to reduce poverty and obtain a socioeconomic welfare impact (Kinde, 2012; Zohir & Matin, 2004). Microfinance is a financial intermediary that provides small loans to a marginalized category of borrowers with little or no collateral assets.

The reforms supported the existence of microfinance sector as banks were allowed to operate as deposit taking microfinance banks while licensed companies as non-deposit taking service providers therefore having both regulated and unregulated institutions, respectively. Before 2019, regulated microfinance institutions in Tanzania were those that take deposits from customers; as of 2020, four banks were licensed to carry out that role (BOT, 2020a). The existence of the Microfinance Act, 2018, led to the issuance of regulations, including the Microfinance (Non-Deposit Taking Microfinance Service Providers) Regulations, 2019; the Microfinance (Savings and Credit Cooperative Societies) Regulations, 2019; and the Microfinance (Community Microfinance Groups) Regulations, 2019 (BOT, 2019b). Further, the Bank of Tanzania delegated its powers and functions to other authorities over Tanzania Cooperative Development Commission (Tier 3) and Local Government Authorities (Tier 4), in the same year 2019, for effective supervision (BOT, 2019b). The existence of the regulatory sphere aims to formalize the existing microfinance sub-sector in order to improve provide a proper business conduct, financial inclusion, and consumer protection initiatives.

2.3 Insurance Sub-sector

Insurance is a legal contract between the insurance company and an individual used to hedge against the risk of uncertain losses that may be assumed (Davies et al., 2003; Madura, 2014). Usually, insurance companies provide financial benefits to the insured through risk-sharing and transfer contracts (IMF, 2019).

Since the insurance sector intends to reduce uncertainty and the impact of losses, the sub-sector can encourage new investments, competition, and innovation,

therefore playing a significant role both direct and indirect in the economic growth and development of a country (Feyen et al., 2013). URT (2020) notes that the first (1991) and second (2006) financial sector reforms led to a transition of the sub-sector in terms of regulations, growth, as well as entry of private sector players in the market. This led to an increase of insurance companies from 2 to 31 of December 2018. The insurance industry is categorized as life, non-life, and re-insurance, of which non-life can be termed as general insurance in other jurisdictions (IMF, 2019). Life insurance operating in Tanzania is 5 in number, accounting for 26.64% of the total insurance assets and 16.66% of the total premiums received. On the other hand, non-life insurance (general insurance) are 25 in number, accounting for 73.36% of total assets and 83.34% of total premium received (TIRA, 2020).

2.4 Social Security Schemes Sub-sector

The ILO has clearly defined social security as a system of contribution based on health, pension and unemployment, protection, along with tax-financed social benefits, social security has become a universal challenge in a globalizing world. The study by Servais (2012) defines social security as the protection provided to individuals and households to ensure access to health care and to guarantee income security, particularly in cases of old age, unemployment, sickness, invalidity, work injury, maternity, or loss of a bread-earner. Existence of social security schemes aim at providing access to health-care facilities as well as obtain a minimum income security in proportion to the level of income contributed (ILO, 2001).

Focusing on Tanzania in particular, the history of social security schemes refers back to the colonial era, where there were informal and traditional protection schemes based on family and community level (Msalangi, 1998). The formal social protection was devised by the colonial rulers for meeting their need as well as their Tanzanians working for the colonial government (Eckert, 2004).

Among the first-generation reforms in 1991 results was the transition of the National Provident Fund to National Social Security Fund (NSSF) in 1997 which became operational in 1998 (Dau, 2003). Some studies noted that the coverage of social protection in Tanzania continued to be on the lower side lying at less than 6.5% of the labor work force, despite the efforts undertaken in the reforms, due to structural challenges, unappealing benefits and majority of the work force not being in the formal economy (Ackson, 2007; Sakthivel & Joddar, 2006). Some development after the 1991 reform included issuance of Social Security Policy of 2003, which focused on expanding the coverage of social security to the informal sector as well as harmonize the existing funds to improvise on rationalizing contribution as well as benefit structures (Ackson, 2007).

The need to have a regulatory organ was imperative for Tanzania to effectively regulate, supervise, and monitor the performance of social security activities. This was established under the Social Security (Regulatory Authority) Act, 2008, a review by SSRA (2008), of which in 2012, the Regulatory Authority became fully fledged as the Social Security Regulatory Authority (SSRA) with a major focus of

developing the parametric formula for rationalizing the Funds as well as creating efficient supervision of the sub-sector. The sub-sector is the second largest of the financial sector, after the banking sector in Tanzania accounting for 26.13% of total financial assets (BOT, 2020a).

2.5 Capital Markets Sub-sector

Capital market is a market for efficient delivery of long-term funds undertaken by participants such as individuals and institutions, traded in the form of debt and equity capital, where buyers and sellers have explicit and implicit claims to capital. The capital market operates in either the primary or secondary market, of which the primary market is where the newly issued securities are traded for the first time. On the other hand, secondary market is where the securities which are previously issued in the primary market are traded and providing an exit mechanism for investors. Capital markets have continued to play an important role in developing and developed economies as a source of alternative funding owing to increased market depth, efficiency, and robustness of their stock exchanges (Widia Astuty et al., 2015).

In Tanzania the capital market is one of the 1991 financial sector reform initiatives which resulted in the establishment of the Regulatory Authority in 1995 to effectively manage capital market-related issues. The Capital Markets and Securities Authority (CMSA) was established under the Capital Markets and Securities Act, 2002, with an aim of promoting and developing efficient and sustainable capital markets, formulating guiding principles for the industry, licensing and regulating capital market players and market development, as well as advising the government on policies and all matters relating to the securities industry (CMSA, 2015).

CMSA (2018) reported that the exchange has witnessed significant developments, hence growing the number of listed companies from 6 in 2005 to 28 in 2018, with an introduction of alternative market, Enterprise Growth Markets (EGM), which aimed at providing an opportunity for small companies, for this particular case community banks, to be able to issue Initial Public Offers (IPOs) and raise capital at the exchange (DSE).

On the other hand, the Tanzanian bond market operating in the stock exchange with bond tenures of 2, 5,7 aimed at lengthening the maturity profile of government debt (Massele et al., 2015). The study by Munisi (2019) showed that investor concentration in the market is in terms of participation, both buy and sell side, and the market capitalization of cross listed companies. The stock exchange is still dominated by foreign participation in terms of trading on both the buy and sale side due to Tanzania citizens' lack of awareness on the benefits of the exchange as well as low efficiency of the market (CMSA, 2019).

The core existence of these financial sector players through the reform cycle has enhanced significant growth in the financial sector for the past 10 years, with the banking sub-sector being substantially dominant at about 70.0% (BOT, 2019a). Figure 1 shows the share of sub-sectors in the financial sector assets which presents

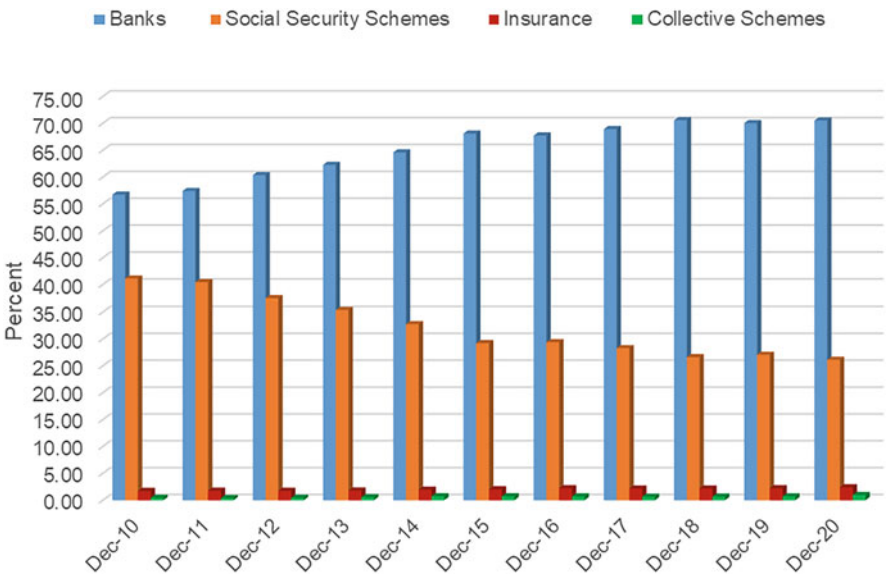

Fig. 1 Financial Sector Assets Composition from 2010 to 2020. Source: Annual reports from Bank of Tanzania (2020)

the banking sector as the dominant sub-sector for the 10 years under review. The banking and insurance sectors have increased their share of assets as the social security sub-sector has declined.

3 Tanzanian Economy

Assessing the benefits of the financial sector reforms witnessed in the different components of the financial sector ultimately calls for assessing the contribution to economic growth. This chapter reviews the economy right after independence to the current state of the economy in 2020.

Therefore, with the key factors observed in the era of post-Independence (1961–1966), when the country had adopted the market economy that was under the British colonial rule, agriculture was the main contributing sector to the economy at approximately 59.0% (Mandalu et al., 2018). This was cemented by the existence of the Arusha Declaration, whereby the study by Nyerere (1977) argued that during the implementation of the declaration time, main focus was on rural development by migrating the ownership of agriculture production to the peasants and workers under the control of government and cooperatives. However, in the 1980s, Gabagambi (2013) denotes the challenges witnessed in the socialism approach that failed to deliver the aspired economic development; with poor performance of parastatals

failing to meet the demand of the people, Tanzania abandoned agriculture in favor of private sector-led industrialization.

With these developments, the aftermath of the economic crisis in Tanzania, witnessed in the 1980s, resulted in the government taking measures to liberalize the economy by embarking on adjustment program policies that aimed to reduce budget deficit and improve monetary policy (Liviga, 2011). In doing so, the government's 1996 Economic Recovery Program sought to revive the export sector by reducing cost-price distortions and introducing import liberalization measures (Kanaan, 2000). With these efforts, Tanzania witnessed an improvement of the economy comparing the years 1980 and 2000, recording real economic growth of 3.3% to 4.9%, inflation rate of 6.0% from 30.2%, and GDP per capita from USD.592 to USD.1228, which signaled improved macroeconomic stability (World Bank, 2021).

Tanzania's population expanded from 10.30 million in 1961 to 59.73 million in 2020, an increase of 4.9 times, with a labor force of 28.03 million, being 49.4% of the population (World Bank, 2021). Despite the episode of economic reforms in Tanzania from 1967 to 1991, the share of labor force in comparison to population is the highest compared to other East African Community (EAC) regional peers, Uganda and Kenya who recorded 44.1% and 36.1%, respectively (World Bank, 2021). Conversely, Tanzania covers 945,087 square kilometers, the largest area covered compared to the EAC regional peers where Kenya and Uganda cover 580,367 square kilometers and 241,037 square kilometers, respectively (World Bank, 2021).

In addendum to two decades of sustained growth, in July 2020, Tanzania migrated to lower-middle-income country from low-income country category, way earlier than the planned time of 2025 (World Bank, 2020). This owed to economic reforms, peace, and tranquility as well as investment in infrastructure projects that led to sustained macroeconomic stability, supporting the economic growth (World Bank, 2020). The migration places Tanzania as the second country to join the middle-income category after Kenya in the EAC region and among the eight Africa countries in that category (World Bank, 2020). Gross domestic product was USD.62.4 billion in 2020, mainly contributed by construction, transport, and storage and agriculture (World Bank, 2020). Tanzania's GDP rate was 4.9%, highest growth rate witnessed in the region for the past 10 years to 2020 (BOT, 2020a).

Further, inflation remained low at 3.2%, within the agreed target of 3–5% in 2020/2021 and the EAC convergence benchmark of 8%,[1] with an annual average exchange rate of TZS/USD 2288.6, mainly contributed by major exports of agricultural produce including coffee, cotton, and cashew nuts (BOT, 2020b).

[1] The EAC and SADC targets are utmost 8.0% and a range of 3–7%, respectively.

3.1 Tanzanian Financial Sector Assets and GDP

As we view the financial sector reforms, financial sector development, and the Tanzania's domestic economy, there is a notable growing contribution of the financial sector to the economic growth. In addition, financial sector depth and increase of access to financial services support the growth observed overtime. Therefore, on a financial stability point of view, it is important to be able to measure the contribution of the financial sector to the economy. Therefore, having an indicator for measuring the economic growth is vital; GDP, being the significant indicator used to measure economic activity, is defined as the value of the goods and services produced by the nation's economy less the value of the goods and services used up in production (Dynan & Sheiner, 2018).

Studies have viewed the relationship between the financial sector and GDP in terms of development, reform implications, as well as growth rate comparability (Beck & Maimbo, 2012; Burgess, 2011; Cecchetti & Kharroubi, 2015).

In order to assess the financial development, the World Bank proposed indicators including private sector credit to GDP ratio, financial institutions' assets to GDP ratio, M2 to GDP ratio, and deposits to GDP ratio. However, this study accesses the depth of the Tanzania financial sector by relating the penetration of each individual sub-sector contribution to GDP as well as the financial sector as a whole. Depth for this particular case means the size, relating whether the country is bank-based or financial market-reliant economy.

Over the past 10 years, the financial sector contribution to GDP has remained above 30%, however, at a decreasing trend owing to the increase in GDP growth more higher than the financial sector assets (BOT, 2020a), as observed in Table 1, showing the trend of contribution of the individual sub-sector assets to GDP as well as financial sector assets to GDP, with the banking sector being the main contributor.

4 The Tanzanian Banking Sectors

As we focus the review of milestones observed in the banking sector in particular, the main issues to consider are understanding of the evolution, regulatory environment, types, ownership, and performance of the banking sector.

4.1 Evolution of the Banking Sector in Tanzania

Evolution of banking sector differs from country to country as described by Russia which was viewed using the institutional matrix, which was noted to have a hybrid system of state-controlled banks performing hybrid functions, those of regular

Table 1 Contribution of the financial sector to GDP (percent)

Sno	Particulars (Assets)	Dec-10	Dec-11	Dec-12	Dec-13	Dec-14	Dec-15	Dec-16	Dec-17	Dec-18	Dec-19	Dec-20
1	Banks	26.52	25.17	25.22	24.60	24.83	26.11	23.19	23.11	23.55	23.64	23.48
2	Social security schemes	19.22	17.74	15.66	13.98	12.59	11.20	10.06	9.48	8.87	9.13	8.70
3	Insurance	0.80	0.77	0.72	0.71	0.75	0.77	0.76	0.73	0.73	0.75	0.79
4	Collective schemes	0.20	0.17	0.18	0.22	0.27	0.27	0.23	0.22	0.22	0.24	0.32
5	Total financial assets	46.73	43.85	41.78	39.51	38.44	38.35	34.25	33.53	33.36	33.75	33.29

Source: Annual reports of Bank of Tanzania

commercial banks and of policy banks, a structure similar to what is observed in China (Kirdina & Vernikov, 2013). Referring to the emerging economies, India's banking history relates to use of temples as a safe custody center during the Hindustani to banks mainly owned and controlled by the state (Gajdhane, 2012). Further, evolution of the banking sector in developing countries, referencing to Nigeria, reviewed the banking sector to have existed for more than a century and almost a half in the economic spheres (Oluduro, 2015). In the same study by Oluduro (2015), the evolution eras were classified eras as between 1892 and 1954, an era of free and monoculture banking; between 1952 and 1985, an era of liberalization efforts among others, having the regulations in place; and between 1986 and present, efforts on structural adjustments, reforms, and consolidation to enhance viability and confidence in the system.

The history of banking in Tanzania goes way back from the colonial era in the early 1900s to date. The colonial era in Tanzania relates to two episodes of German rule and British rule. During the German rule, the banking sector was established mainly to serve the colonial rulers and few businesses, with two banks, Ostrafrikanische Bank and Handelsbankd fur Ostafrika in 1905 and 1919, respectively. The focus was not reference rather to quote year for establishment and bank (Lwiza & Nwankwo, 2002). According to BOT (2011) and Ndalichako (2016), during the colonial era, the banking sector was mainly aimed to serve the colonial economy as it was characterized by dominance of foreign-owned commercial banks. Further, studies by Kimei (1987) and Lwiza and Nwankwo (2002) also stated that during the colonial period, there was no central bank to regulate and supervise the institutions, therefore lacking financial access to productive sectors of the economy as well as geographical concentration of the banks in urban areas.

Studies noted that, right after independence of 1961, the country's banking industry was comprised of eight banks, with establishment of government-owned banks starting from 1964 to 1966 (BOT, 2011; Kimei, 1987; Lwiza & Nwankwo, 2002). However, a study by Simpasa (2011) highlighted the challenges observed in the government-owned banks established, owing to the socialism era including, poor service delivery, existence of high non-performing assets (NPA), increase in the subsidies to the banks, as well as non-dividend declaration, among others. Conversely, the drawbacks led to the establishment of the regulatory framework in Tanzania, as part of the financial sector reforms, enactment of the Banking and Financial Institutions Act (BFIA) in 1991, in implementing part of the recommendations of the Nyirabu Commission (Lwiza & Nwankwo, 2002; Ndalichako, 2016; Simpasa, 2011).

Therefore, the existence of the legal framework, the Act, provided the Bank of Tanzania powers to license, regulate, and supervise banks and financial institutions (BOT, 2011). Further, the aftermath of reforms also led to the entry of foreign and domestic private banks in the market as well as nationalization and restructuring of the government banks (Lwiza & Nwankwo, 2002). In due course of these developments, the entry of foreign banks in the market and the enactment of the BFIA, the banking sector in Tanzania has experienced failures of more than six banks and financial institutions, mainly caused by failure of their parent banks (BOT, 2011).

However, these failures did not lead to loss of depositors' money and no significant impact to the overall banking sector (Mlozi, 2002).

As part of improving reforms, initiatives for rigorous supervision were taken on board in 2006, where the legal and regulatory environment was enhanced, whereby Bank of Tanzania Act, 1995, and Banking and Financial Institutions Act, 1991, were revoked and replaced by Bank of Tanzania Act, 2006, and Banking and Financial Institutions Act, 2006, which became effective in July 2006 (BOT, 2006b). In the same study, BOT (2006b) narrated that, the changes were made to take into account market developments as well as support the privatization and restructuring process of government-owned banks.

There has also been substantial development following the enactment of the Act, where government efforts in encouraging formulation of regional/community banks resulted in establishment of 12 banks (BOT, 2019b). However, due to impaired capital levels and liquidity problems owing to growing number of non-performing loans, poor governance, and limited economies of scale, six banks failed to regain their capital positions hence as per compliance to be placed under liquidation (BOT, 2019a).

In 2019, mergers of banks including Mwanga Community Bank, EFC microfinance, and Hakika Microfinance bank to form Mwanga Hakika Microfinance Bank Plc; Exim Bank Plc taking over UBL commercial bank; and Tanzania Postal Bank taking over TIB Corporate bank also were some of the developments observed (BOT, 2019b).

4.2 Types of Banks in the Banking Sector of Tanzania

The Tanzanian banking sector size has increased with a growing expansion of different types of banks including commercial banks, development institutions, community banks, and microfinance institutions. Despite the closure of banks in 2017, following the poor performance and governance (BOT, 2019a), the existing 46 banks remain resilient to shocks with adequate capital buffers (BOT, 2020a, 2020b). Defining the different categories of banks operating in Tanzania and the adoption of the same is imperative to establish the line between the categories.

According to Daiff and Daiff (1995), commercial banks refer to financial institutions based on trade funds and craft their basic as they act as an intermediary between capital and investments and with the investments seek access to private capital. The second type of banks is development banks that are defined as institutions usually linked to national governments that invest in sustainable private sector projects aiding to bridge the gap between public and private sector (Além & Madeira, 2015; Kingombe et al., 2011). The third category of banks is microfinance institutions of which as proposed by some studies including Hartarska (2005), Labie and Mersland (2011), and Olugbenga and Mashigo (2017) are seemingly different from one another. However, the essence of the definitions is usually the same. These

studies view microfinance institutions as the provision of small-scale financial services to low-income or unbanked people.

The fourth category is community banks which are usually related to the basic services they provide that are limited to a specific geographical location; however, others may have outlets or branches in operation (DeFatta, 2015; Lux & Greene, 2015).

In the wake of the reforms to date, 2020, the Tanzania banking sector constitutes of 46 banks operating in Tanzania, whereby commercial banks (35), development financial institutions (2), community banks (5), and microfinance banks (4) account for 95.2%, 3.6%, 0.6%, and 0.3% of the total assets, respectively (BOT, 2020a, 2020b). Further, commercial banks constitute the largest in terms of asset size from 2010 to 2020, in the Tanzania banking sector. In developing countries like Tanzania, banks continue to dominate the financial sector as the capital markets are still at nascent stage of growth, signaling the significance of banks in financial development as well as the intermediation role in stimulating economic growth.

Ownership structure as per the Bank of Tanzania Act, 2006, means a bank or financial institution having more than 50.0% of shares either local or foreign (BOT, 2006a).

Studies by Fund (2018) and Tanzania (2019) showed the dominance of commercial banks in Tanzania of more than 90%, while community banks, microfinance banks, as well as development financial institutions hold the remaining portion. The similar trend is observed in Table 2 for the past 10 years depicting high concentration risk on the performance of the commercial banks.

4.3 Banking Sector Performance in Tanzania

Assessment of the performance of the banking sector is very important for developing economies like Tanzania, due to the high reliance on the banking sector to undertake the intermediation function as well as achieve sustainable economic growth. With the banking sector taking up more than 70% of the financial assets and a growing bank asset to GDP ratio of 25%, banks remain more dominant due to having a nascent financial market that would provide alternative sources of financing for companies. Performance of the banking sector as ascribed by financial soundness indicators (FSIs) provides a light of how the sector is fairing along all the other operational activities. Financial soundness indicators were developed and used for financial stability analysis even before the global financial crisis of 2008/2009, in addition to the other economic and financial analysis tools (Craig & Sundararajan, 2003; Fund, 2006; San Jose et al., 2008; Sundararajan et al., 2002). In light to the international financial turmoil of the late 1990s, the urge to enhance financial stability assessment, through broad search for tools and techniques to monitor vulnerabilities, improve risk assessment, and ensure soundness of the financial sector, as well as prevent further financial crises, was prompted (Sundararajan et al., 2002).

Table 2 Market share of the banking sub-sector from 2010 to 2020

Type of Banks	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Commercial banks	97.6	97.3	97.4	96.9	96.5	96.0	95.6	95.4	95.7	94.3	95.1
Community banks	0.5	0.5	0.6	0.6	0.6	0.7	0.7	0.9	0.4	0.5	0.6
Microfinance institutions	0.0	0.0	0.0	0.4	0.5	0.5	0.6	0.6	0.6	0.5	0.3
Development financial institutions	1.9	2.1	2.0	2.1	2.3	2.8	3.1	3.1	3.4	4.8	3.9

Source: Tanzania Financial Stability Reports (2020)

Therefore, FSIs were developed; a compilation guide was formed that defines FSIs as indicators that depict the current financial health and soundness of the financial institutions in a country and of their corporate and household counterparts (Fund, 2006). FSIs include both aggregated information on financial institutions and indicators that are representative of markets in which financial institutions operate. In addition, the role of FSIs gained momentum in light of the financial crisis and as one of the recommendations of the G-20 Data Gaps Initiative.

Further the growing need of improving the FSIs as early warning signals has gained momentum owing to recent episodes of instability including the COVID-19 pandemic that has further highlighted the importance of continuous monitoring of financial systems as a crisis prevention tool. In light of these, several studies have shown the relationship between the financial soundness indicators with macro-prudential framework, profitability, banking crises, and financial crises (Navajas & Thegeya, 2013; Schou-Zibell et al., 2010; Yaaba & Adamu, 2015).

Therefore, this study will use the financial soundness indicators that are used to measure the strength of the banking sector based on solvency to liquidity related, with the view of capital adequacy, liquidity, profitability, asset composition and quality, and sensitivity to market risk (BOT, 2020a). Further, assess the indicators in line with the IMF compilation guide (IMF, 2019).

4.3.1 Capital Adequacy of Tanzanian Banking Sector

Capital adequacy ratios have been prominent in finance literature given the significance in ensuring safety, efficiency, and stability of the banking sector (Bialas & Solek, 2010). Capital adequate ratios not only ensure solvency but also operate as a shield against loss, which in return ensure banks' sustainable economic operations with satisfactory return. The Basel Accord, an international standard for the calculation of capital adequacy ratio, has been the forerun on developing and enhancing computation and requirements of capital. This aimed at ensuring enough buffers are available to cushion against potential exposures in case they materialize, after drawing from past experiences of the crises (Aspal & Nazneen, 2014; Bateni et al., 2014).

The Basel Accord ranges from Basel I to IV, and all among other indicators have been enhancing the computation of capital adequacy (FSB, 2010; Kombo, 2014; Oyetade et al., 2020). Studies by Arnold et al. (2012), Bateni et al. (2014), Malimi (2017), and Pastory and Mutaju (2013) assessed the relationship between capital adequacy and other selected indicators ranging from bank size, profitability, and asset quality indicators. The findings denote that capital adequacy is more aligned to asset quality and profitability ratios. Capital adequacy ratio is defined as the amount of core capital banks must hold, commensurate to the amount of risk weights they carry on the assets their balance-sheet as defined by nation authorities or aligned to the Basel Accord computation (FSB, 2010; Rognes, 2020). The Basel Capital Accord distinguished the capital elements for core to obtain Tier 1 capital and for supplementary to obtain Tier 2 capital (Aspal & Nazneen, 2014).

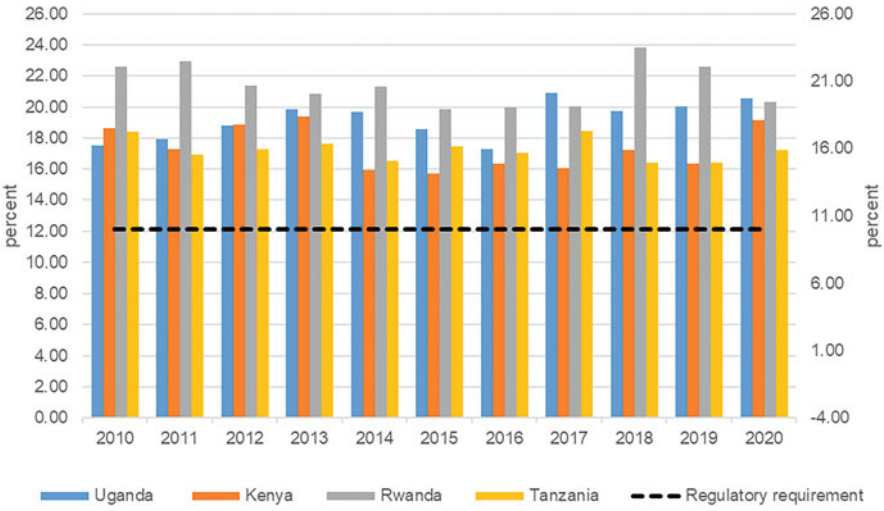

Fig. 2 Capital adequacy ratios from 2010 to 2020. Source: EAC Financial Stability Central Banks (CBK, NBR, BOU, and BOT)

A set of micro-prudential measures have been stipulated since the onset of reforms aimed at enhancing supervision and reducing the magnitude of exposure to safeguard the banking sector by ensuring adequate capital buffers within the agreeable ratios. Tanzania draw to the fact that the country is still full compliant with Basel I Accord that requires banks to maintain a minimum core capital requirement of 8% of risk-weighted assets. However, Tanzania has adopted partially components of Basel II and III on capital computation thus moving the capital requirement of 12.5% of the core capital and 14.5% of the regulatory capital (BOT, 2014a, 2014b, 2014c). On the EAC level, Rwanda is the only country that has already adopted Basel III in computation of capital, meaning moved to using the Common Equity Tier One capital rather than the core capital (Rwanda, 2019).

Illustratively, over the 10 years to 2020, the banking sub-sectors for all the EAC countries were resilient and maintained high capital buffers above the minimum regulatory requirement of 10% and 12%. Figure 2 shows a regional comparison with Uganda and Rwanda maintaining substantially higher buffers.

4.3.2 Banking Sector Liquidity in Tanzania

On the other hand, solvency risks can be stimulated by liquidity risks; therefore liquidity assessment is crucial for the banking sector. Liquidity constraints are one of the major hindrances of the banking sector sustainability within a short period of time (Arif & Anees, 2012). During 2008/2009 global financial crisis, many banks ignored the impact of liquidity risk and had put less prudential regulations on management, which, therefore, resulted in the bottleneck of the crisis triggering

other risk factors in the long run (IMF, 2019). The crisis changed the perspective and how regulators viewed liquidity risk management which led to more regulatory requirements and enhanced liquid asset criteria (Chen et al., 2018; FSB, 2010; Marozva, 2015). Therefore, liquidity resolution is one of the Central Bank's roles as the lender of last resort to banks that may face challenges. Basel (2008) defines liquidity as the ability of the bank's assets to meet obligations as they fall due, without incurring unacceptable losses.

Therefore, the inability of a bank to meet its obligations when they fall due without incurring unacceptable losses is termed as liquidity risk, which may either be of funding or market-related risk. The 2008/2009 crisis exhibited a funding liquidity risk impact that dried the interbank market, and the Central Banks were on the rescue to pump funds through the standby facilities to recue banks from the liquidity challenges (Dahir et al., 2018; Nikolaou & Drehmann, 2009). On one hand, Drehmann and Nikolaou (2013) defined funding liquidity risk as the inability of a bank to meet obligations with immediacy, within a specific time horizon. On the one hand, market liquidity risk views liquidity from a cost and liquidation perspective or challenge due to inadequate market depth or disruption; therefore not realizing the cost of trading an asset relative to fair value can be realized (Vodova, 2011).

Further, different studies by Kumar and Yadav (2013) and Préfontaine et al. (2010) have viewed liquidity risk in isolation as a compliance and management issue as well as an impact assessment in terms of relationship with the banking sector. Conversely, the relationship between liquidity risk and the relationship with other banking sector performance indicators who assessed, of which results revealed that profitability was the most related exposure in case a liquidity challenge occurs (Arif & Anees, 2012; Ariffin, 2012; Chen et al., 2018; Marozva, 2015; Tesfaye, 2012).

In Tanzania, liquidity management is governed under the Banking and Financial Institutions (Liquidity Management) Regulations, 2014, which aims at ensuring banks are able to meet all obligations in time, put in place liquidity management strategies to mitigate liquidity risk exposures, as well as maintain public confidence by meeting the liquidity standards stipulated management regulations in addition to the Bank of Tanzania Act, 2006 (BOT, 2014b). The early warning indicator for liquidity exposure is the liquid assets to customer deposits liabilities ratio, which has also a regulatory requirement of not being less than 20.0% (BOT, 2014b).

Tanzania's banking sector for the past 10 years has maintained a relatively stable liquidity ratio; however, the level is lower than other regional peers as attested by Fig. 3. Rwanda was left out in liquidity assessment for regional comparison, as they have adopted the liquidity coverage ratio and disregarded the normal liquidity ratio hence challenge of data availability (Rwanda, 2019).

4.3.3 Profitability as an Efficient Ratio of Banking Sector in Tanzania

While we view solvency and liquidity, market efficiency forms an integral part that supports existence of the two as effective functioning of operations will ensure liquidity and solvency are maintained. Market efficiency as measured by profitability

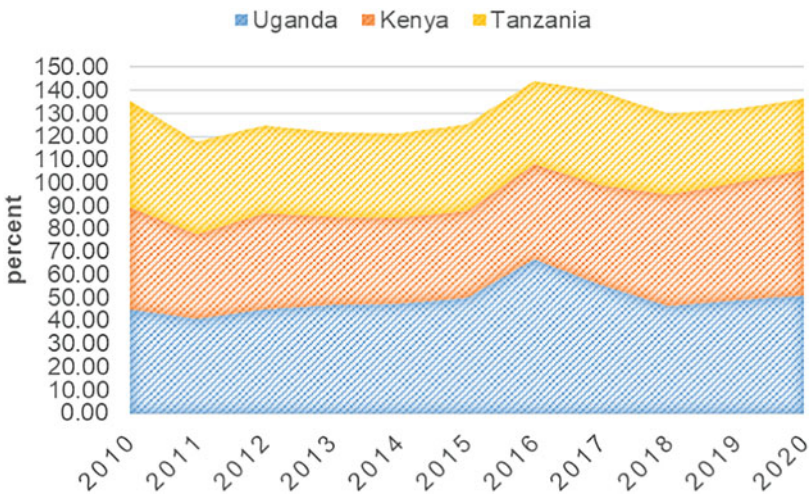

Fig. 3 Liquidity ratio 2010 to 2020. Source: EAC Financial Stability Central Banks (CBK, NBR, BOU, and BOT)

is a resultant of the functioning of the bank operations through efficient usage of capital and available assets. Indicators that are predominantly used to represent profitability are return on assets (ROA), return on equity (ROE), and net interest margin (Gul et al., 2011; IMF, 2019). In addition, Gul et al. (2011) considered return on capital employed (ROCE) as one of the profitability indicators. These indicators are usually considered to assess a business's ability to generate earnings relative to its revenue.

Bank profitability ratios can be determined by either internal that are manageable and controllable factors by the bank including non-performing loans, deposits, liquidity, investment in securities or external factors, of which control of these is beyond the bank including inflation rates, exchange rates, interest rates, market share, as well as growth (Gyamerah & Amoah, 2015; Rasiah, 2010).

Agbeja et al. (2015) viewed profitability as a dependent ratio which can be influenced by capital adequacy ratio; therefore maintaining more equity has a positive impact to profitability. On the other hand, Bikker and Vervliet (2018) reviewed the undue influence that interest rates have on bank profitability, ultimately having an impact to financial stability in the due course.

In Tanzania when assessing the performance of the banking sector and financial stability, profitability indicators also form part of the financial soundness indicators with major concentration on return on assets (ROA), return on equity (ROE), and net interest margin, as what (Gul et al., 2011; IMF, 2019).

Return on Assets is defined as the ratio that reflects how well a bank efficiently manages their assets to generate profits (Bikker & Vervliet, 2018; Gul et al., 2011). IMF (2019) defined return on equity (ROE) as a ratio that determines how efficient banks are using their capital (Gul et al., 2011). Net interest margin is defined as the

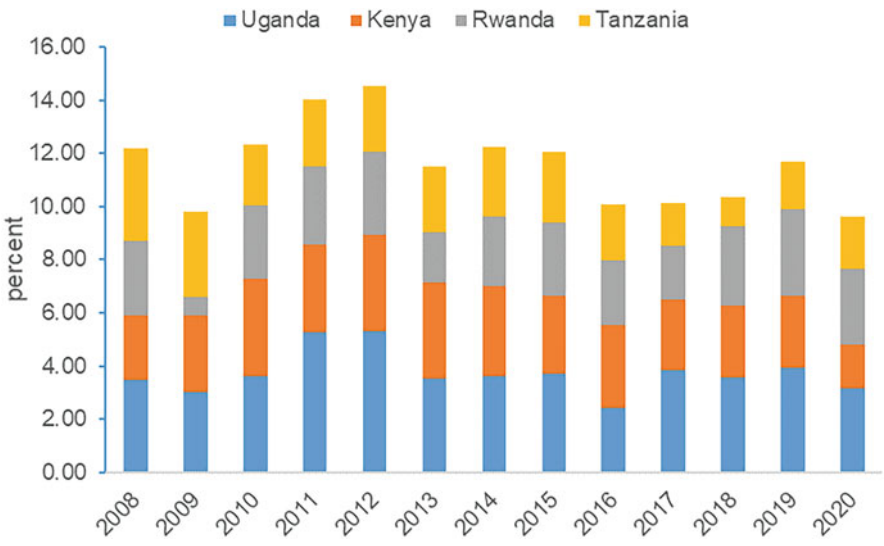

Fig. 4 Trend for return on assets from 2008 to 2020. Source: EAC Financial Stability Central Banks (CBK, NBR, BOU, and BOT)

difference between interest income and interest expenses against gross income, which aims to evaluate the efficiency and effectiveness of banks (Khan & Jalil, 2020).

Despite the global crisis 2008–2009, EAC banks' profitability as represented by return on assets (RoA) was relatively stable, except for Rwanda that depicted a slight drop in 2009, with a revamp in the following year. Illustratively, from 2014 to 2019, Tanzania has been observing the lowest ratio of profitability among the four EAC observed countries as shown by Fig. 4.

4.3.4 Tanzania Banking Sector Asset Quality

The aftermath of the global financial crisis 2008/2009 showed the significance of asset quality to the stability of the financial system. Further, profitability, liquidity, as well as the capital adequacy of the banking sector are highly affected by the performance of the asset quality (Lucky & Nwosi, 2015; Pastory & Mutaju, 2013).

Asset quality is an essential part of sound and stable banking sector that involves the evaluation of the bank's assets in order to obtain the level and size of credit risk related with the bank's operations (Kadioglu et al., 2017; Lucky & Nwosi, 2015; Swamy, 2015). Further, asset quality aims at assessing credit risk of the banking sector which is a very significant exposure due to the high interconnectedness with profitability and economic growth (Ekinci, 2016). In most cases, asset quality in the banking sector is represented by non-performing loans (NPLs) (Raj et al., 2020).

Generally, non-performing loans (NPLs) has been defined as loans whose contractual obligation for repayments of are past due 90 days (Bholat et al., 2016; BOT, 2014c; IMF, 2019). In order to measure the NPLs behavior, a ratio is computed. NPL ratio is a lagging indicator that is obtained by dividing gross non-performing loans to gross loans of a bank's portfolio. This ratio aims at identifying problems in the asset quality with an increasing ratio signaling more exposures and challenges in the portfolio (IMF, 2019).

Different authorities assess credit risk using the NPL ratio; however, there is no prudential threshold for the ratio to determine the minimum requirement. Nevertheless, authorities tend to undertake comparison among peer countries in addition to the trend of the ratio (Bholat et al., 2016). For the case of Tanzania, there has been put in place an acceptable level of NPLs to be not more than 5.0% (BOT, 2020a). The study revealed that the banking sector in Tanzania for the past 10 years has recorded NPL levels above the acceptable level of 5.0%, signaling the impact of individual banks performance weighing the ratio to high levels.

However, credit risk as depicted by non-performing loans (NPLs) continues to be high above the 5.0% threshold for the past 10 years and stands at 9.8% as of December 2019 (Tanzania, 2019). This has been noted to be the major source of risk that can impair capital positions of the banks (Tanzania, 2018, 2019).

It is further noted that most of the challenges witnessed in the Tanzanian banking sector from 2015 to 2019 originated from credit that led to closure of six banks and buyout of one of the top ten banks (Tanzania, 2018, 2019).

In addition to NPLs, asset quality is assessed using NPL net of provisions to total capital that intended to gauge the potential impact on capital of the portion of NPLs not covered by specific provisions as well as earning assets to total assets, that the ability of banks to invest in assets that deduce a return for the sustainability of operations of the bank (IMF, 2019).

Drawing from the graph in Fig. 5, the non-performing loans ratios as per EAC region comparison are all lying above 5.0% above the acceptable level.

4.4 Conclusion

This chapter provides an overview of the financial sector in Tanzania with major focus on the banking sub-sector. The chapter dwells on reviewing the financial sector reforms and understanding the contribution of each sector to GDP as well as the financial sector. Further, the chapter reviewed the evolution, composition, as well as performance of the banking sub- sector relative to the regional peers.

The review noted that the banking sector was the prominent sector from colonial era to date, and the major reform focused on enhancing the sub-sector as other sectors' share is 30.0% combined (social security schemes, insurance, and collective schemes) assets. Notably, regulatory reforms have led to substantial growth in the financial sector as well as being a contributor for Tanzania's economic prospects supporting the financing of development projects as well as other economic

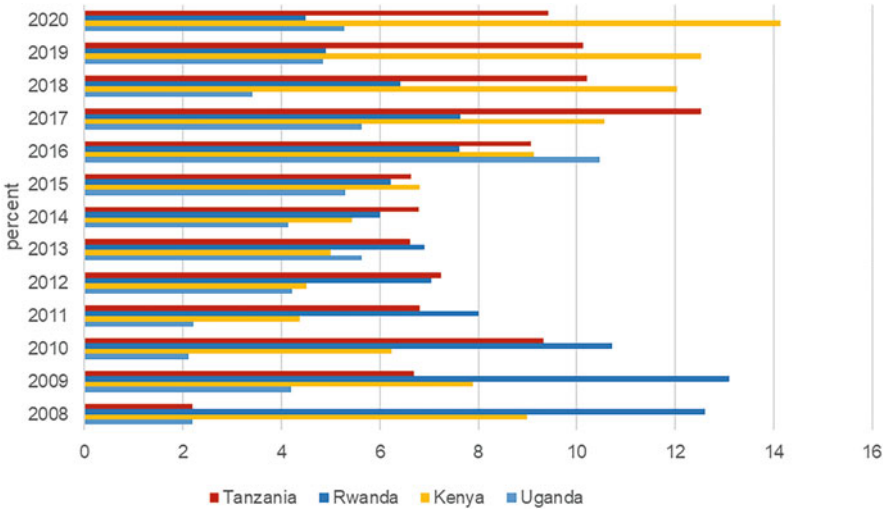

Fig. 5 Asset quality (non-performing loans ratio): 2010 to 2020. Source: EAC Financial Stability Central Banks (CBK, NBR, BOU, and BOT)

activities. This chapter notes that banks are still resilient with high capital adequacy ratios above the regulatory requirement and maintaining liquidity ratios above the 20.0% minimum requirement. However, the concern remains on the quality of assets as the non-performing loans ratio remains above the acceptable level of 5.0% for the past 10 years, hence warrant monitoring.

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Causal Relationship Between Financial Development, Economic Growth, and Income Inequality: Panel Data Evidence from Asian and North African Countries

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Abstract This study address whether financial development and economic growth will decrease income inequality. A sample of 11 Asian and 4 North African countries was examined over 1996–2019. Various tests for stationarity, cointegration and causality, and robust estimation methods were applied. The results confirm a long-run cointegrating relationship between the variables. Based on FE regressions, pooled OLS, and system GMM estimates, it is shown that there is a significant growth threshold effect in the inequality–growth nexus. It implies that the long-run rise in real income per capita reduces inequality. It was found an inverted U-shaped relationship between economic growth and income inequality. Our findings also show a significant financial development threshold effect in the finance–income inequality nexus, confirming an inverted U-shaped relationship between all the financial development proxies and income inequality. Furthermore, the Granger causality tests show a long-run unidirectional causality running from all the proxies of financial development to income inequality. In contrast, there is evidence of a long-run unidirectional causality running from income inequality to economic growth.

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1 Introduction

Enhancing access to financial institutions and reducing inequality plays an important role in achieving the Sustainable Development Goal (SDG10) supported by the United Nations 2030 Agenda, especially in developing countries. Empirical research on the linkage between financial development and growth as well as financial development and inequality nexus suggested that economies with better functioning financial systems—both the development of banks and stock markets—play a crucial role in promoting economic growth (Levine, 1997; Levine et al., 2000; McKinnon, 1973; Shaw, 1973) and reducing income inequality (Agnello & Sousa, 2012; Beck et al., 2007; de Haan et al., 2018; Hoi & Hoi, 2012; Jalil & Feridun, 2011; Nikoloski, 2013; Satti et al., 2015; Shahbaz et al., 2015; Stiglitz, 2015; Younsi & Bechtini, 2018; Zhang & Cheng, 2015). Earlier studies have also suggested that economic growth is the most powerful driver for reducing inequality (Ahluwalia, 1976; Deininger & Squire, 1996; Papanek & Kyn, 1986; Rehman et al., 2008).

Recently, the link between financial development and income inequality has generated considerable interest among researchers and practitioners. Empirical studies on the financial development and income inequality nexus suggest that well-functioning financial systems and well-developed stock markets can provide cheaper credit, easy access to finance to various people. It also enhances entrepreneurial activities, which consequently create job opportunities and improve the welfare of the society (Baligh & Piraee, 2012; Clarke et al., 2006; Nikoloski, 2013; Younsi & Bechtini, 2018). Likely, the accessibility of credit at inexpensive cost may offer decisive support to the financially lower-income families by letting them invest in education and health to boost human capital formation in the overall economy, which will certainly help the income distribution and reduce poverty (Beck et al., 2007; Kaidi & Mensi, 2016; Kappel, 2010; Sehrawat & Giri, 2015). Nevertheless, it is argued that deficiency in the banking and financial sector and lack of strong financial markets lead to a more income inequality, which helps entrepreneurs and harms lenders through its effect in lowering the capital's rental rate (Daisaka et al., 2014; Hye & Islam, 2013; Mookherjee & Ray, 2003; Satti et al., 2015; Westley, 2001).

The financial sector development of the emerging countries has contributed to the impressive growth of Asia region. However, many Asian countries have undergone profound economic and social changes in recent years due to their fast growth, which reached, for example, in India (8.25%) and the Philippines (7.15%) in 2016; China (6.95%), Malaysia (5.81%), and Singapore (4.52%) in 2017; and Indonesia 5.17% in 2018. Besides, the domestic credit to private sector and broad money supply show an overall upward trending, thus providing significant positive insight toward Asia's

financial sector development. Accordingly, Japan, Singapore, China, South Korea, India, Thailand, Malaysia, Indonesia, Vietnam, and the Philippines are considered as the ten most advanced countries of the Asia region and have greatly specialized financial markets. For example, Japan ranks fifth out of the set of 62 countries in the financial development area, Singapore (16th rank), China (20th rank), South Korea (22th rank), India (25th rank), Thailand (27th rank), Indonesia (43th rank), the Philippines (45th rank), and Vietnam (52nd rank) (World Economic Forum, 2015). Nonetheless, inequality has grown markedly in Asia unlike to many regions due to the fall in labor income share in national income, and the rise in government spending on human capital. The Gini index offers quantifiable proof of that fact. According to World Bank (2019), the Gini index, for example, in Malaysia, is recorded 49.10 in 1997, with a lowest index (41.1) in 2015. For the Philippines, it is recorded 47.7 in 2000, while it reached its minimum (42.3) in 2018. Singapore recorded a lowest value of Gini index (40.0) in 2016, while it attained its maximum (54.0) in 2003. For Thailand, it is recorded a minimum value (34.9) in 2019 and a maximum value (47.9) in 1992. For the considered North African countries, the provided data also reveal that income inequality in Algeria, Egypt, Morocco, and Tunisia has been growing substantially in recent decades.

In recent years, the impacts of financial development and economic growth on income inequality are a major concern to economists and practitioners in the long-term growth and have critical policy implications. To the best of the author's knowledge, only a few studies have studied the financial development and income inequality causal nexus (e.g., Azam & Raza, 2018; Selim & Güngör, 2020; Shahbaz et al., 2015; Younsi & Bechtini, 2018). Some studies have focused on income inequality and specific financial development indicators, such as domestic credit to the private sector to GDP ratio (e.g., Batuo et al., 2010; Law et al., 2014; Park & Shin, 2017; Sehrawat & Giri, 2015), broad money supply to GDP ratio (e.g. Kappel, 2010; Kim & Lin, 2011), or stock market capitalization to GDP ratio (e.g., Park & Shin, 2017; Sehrawat & Giri, 2015). However, no study has addressed how economic growth and financial development affect income inequality in a study covering Asian and North African countries by applying nonlinear panel data models. Therefore, the objective of this chapter is to fill the gap in the literature by addressing the causal connectedness among financial development, economic growth, and income inequality and analyzing the inverted U-shaped relationship between economic growth and income inequality and between financial development and income inequality for five different financial development indicators for a sample of 11 Asian and 4 North African countries over the period 1996–2019.

This study brands several contributions. First, we analyzed whether economic growth and financial development affect income inequality. For this purpose, we constructed a financial development index by applying the principal component analysis (PCA) method based on four indicators used to measure financial sector development (i.e., domestic credit to the private sector as a share of GDP; domestic credit to the private sector by banks as a share of GDP; broad money supply or liquid liabilities as a share of GDP; stock market capitalization as a share of GDP). Second, we used Pedroni (2004) and Kao (1999) panel cointegration approaches to determine

the long-run cointegrating relationship among the variables. Third, in order to be robust, we have applied three different estimation methods, that is, fixed effects (FE) regressions, pooled ordinary least squares (OLS), and generalized system method of moment (GMM) estimators. Pooled OLS and system GMM methods are used to assess whether our findings from FE regressions are robust. Furthermore, the panel Granger causality test has been applied to test whether there is a long-run causal relationship among the variables.

The remainder of this chapter is organized as follows. Section 2 reviews the literature on the effects of financial development and economic growth on income inequality. Section 3 outlines the dataset and the methods used. Section 4 presents the empirical results. Section 5 concludes and provides recommendations to policymakers.

2 Literature Review

2.1 Financial Development–Income Inequality Nexus

The study findings can generally be grouped into two research strands based on the existing literature on the relationship between financial development and income inequality. The first strand includes studies that found that financial development reduces income inequality; the second strand includes the studies which found that financial development increases income inequality.

The first strand of studies supporting the inequality-narrowing hypothesis (Banerjee & Newman, 1993; Galor & Zeira, 1993; Mookherjee & Ray, 2003) argued that when the financial sector expands more, the poor people could easily have access to it. Most studies that found evidence on inequality-narrowing hypothesis suggested that countries with higher level of financial development have less income inequality. For example, Li et al. (1998) studied 40 developed and developing countries from 1947 to 1994. They suggested that well-established financial development leads to a significant reduction in income inequality. Liang (2006) also studied the nexus between financial development and income inequality for China over 1986–2000 and found that financial development leads to less income inequality. In the same context, Jalil and Feridun (2011) applied Autoregressive Distributed Lag (ARDL) bounds testing for 1978–2006 and concluded that a well-established financial sector could reduce income inequality in China. Clarke et al. (2006) found a negative connectedness between financial development and income inequality for 83 developed and developing countries over 1960–1995. Their results confirmed the findings of Banerjee and Newman (1993) and Galor and Zeira (1993). Beck et al. (2007) investigated the relationship between financial development and inequality for 72 countries from 1960 to 2005. They found that financial development helps in increasing the income levels for the poorest quantile, consequently reducing income inequality. It was shown that almost 40% of the increase in the income levels of the poorest quantile is due to a fall in income inequality levels. In contrast, 60% was due

to the effect of financial development on economic growth. Canavire-Bacarreza and Rioja (2008) examined the influence of financial development on different levels of income distribution for the Caribbean and Latin America from 1965 to 2005. Their empirical results revealed that income for the last quintile of poverty remained unchanged with a better functioning financial system. On the contrary, it exhibited that the second, third, and fourth quintiles were positively affected, resulting in lower-income inequality.

Moreover, in the case of India, Ang (2010) found a negative relationship between financial development and income inequality over 1951–2004. Bittencourt (2010) tested the relationship between financial development and income inequality for Brazil over 1980–1995 and found a significant negative relationship between them. Batuo et al. (2010) used the dynamic panel estimation method (GMM) to examine the effect of financial development on income inequality in 22 African countries for the period 1980–1995. They found that financial development helps in reducing income inequality. Kappel (2010) studied the impact of financial development on income inequality and poverty for 78 countries over 1960–2006 and concluded that financial development tends to reduce income inequality only in medium- and high-income countries. Baligh and Piraee (2012), Shahbaz et al. (2015), and Satti et al. (2015) showed that financial development helps in reducing inequality in Iran and Kazakhstan. Hamori and Hashiguchi (2012) also showed that financial deepening helps reduce income inequality during the period 1963–2002 in 126 countries. Hoi and Hoi (2012) found a negative association between financial development and income inequality in Vietnam from 2004 to 2008. Kapingura (2017) found that financial development effectively diminishes inequality in South Africa both in the short and long term. More recently, Ridzuan et al. (2019) showed that the deepening of financial development in Singapore had enhanced the country's income gap within the society. Selim and Güngör (2020) implemented pooled mean group estimation for 11 MENA countries over the period 1990–2015 to investigate the impact of financial development on income inequality. They found a negative association between financial development and income inequality.

The second strand of the empirical studies supported the inequality-widening hypothesis proposed by Rajan and Zingales (2003). This hypothesis assumed that only the rich could offer collateral to gain access to finance because they can repay for their loans, unlike the poor, so bankers or lenders excluded the poor from the market. As the banks and markets develop, it becomes even more difficult for the poor to access finance. The evidence on the inequality-widening hypothesis was found by many researchers such as Behrman et al. (2001), who suggested that the disadvantages and shortcomings of financial development caused poor individuals to be negatively affected by the circle of income inequality. In the case of Malaysia, Law and Tan (2009) showed that financial development was found to be statistically insignificant in reducing income inequality for the period 1980–2000. This result is confirmed by Mansur and Azleen (2017) for Malaysia for the period 1970–2007. Wahid et al. (2012) used the same methodology for Bangladesh from 1985 to 2006 and found the same results. Besides, Jauch and Watzka (2016), Jaumotte et al. (2013), Johansson and Wang (2014), Li and Yu (2014), Sehrawat and Giri (2015),

de Haana and Sturmc (2017), Park and Shin (2017), Koh et al. (2019), and Gharleghi and Jahanshahi (2020) found that well-developed financial sectors lead to an inequality-widening effect.

Another new growing body of research that has received great attention under this topic since the last two decades is validating the financial Kuznets curve hypothesis proposed by Kuznets (1955). It is also known as the Greenwood–Jovanovich (GJ) hypothesis (Greenwood & Javanovic, 1990), which argued that income inequality first increases and then decreases as higher levels of economic development are reached. Larger segments of society can access the growing financial markets. It holds the inverted U-shaped hypothesis between financial development and income inequality. Several recent studies provide evidence of an inverted U-shaped relationship between financial development and income inequality (e.g., Azam & Raza, 2018; Baligh & Piraee, 2012; Destek et al., 2020; Nguyen et al., 2019; Nikoloski, 2013; Rehman et al., 2008; Rötheli, 2011; Shahbaz et al., 2015; Younsi & Bechtini, 2018; Zhang & Cheng, 2015). Other studies reported the nonlinear U-shaped linkage between financial development and income inequality due to threshold effects (e.g., Ang, 2010; Batuo et al., 2010; Clarke et al., 2003; Hoi & Hoi, 2012; Tan & Law, 2012). In contrast, another strand of research found mixed results (e.g., Bahmani-Oskooee & Zhang, 2015; Puji, 2013; Ridzuan et al., 2021).

2.2 Economic Growth–Income Inequality Nexus

The nexus between economic development and income inequality was primarily investigated by Simon Kuznets (1955), who examined the economic growth and income inequality relationship and hypothesized an inverted U-shaped relationship between economic development and income inequality—the well-known Kuznets curve hypothesis. Kuznets claimed that income inequality increases during the farming phase of economic development, slows down during industrial development, and declines during the upsurge of the service sector. Advocates of an inverted U-shaped relationship between economic growth and income inequality include Ahluwalia (1976), Papanek and Kyn (1986), Deininger and Squire (1996), Rehman et al. (2008), Shahbaz (2010), Park and Shin (2017), and Younsi and Bechtini (2018). Earlier studies proved whether the relationship between economic growth and income inequality is nonlinear U-shaped. For example, Shahbaz and Islam (2011) found that economic growth exhibited a U-shaped pattern with income inequality in Pakistan from 1971 to 2005. However, the study of Alesina and Rodrick (1994), Persson and Tabellini (1994), Clarke (1995), Block (2000), Herzer and Vollmer (2012), Malinen (2012), and Stewart and Moslares (2012) predicted a negative relationship between economic growth and income inequality, in which income inequality decreases as higher levels of economic development are reached. On the other hand, Majeed (2010), Delbianco et al. (2014), Huang et al. (2015), and Shahbaz et al. (2017) found evidence supporting the hypothesis that larger income

per capita volatility is positively and significantly associated with higher-income inequality.

3 Data and Methods

3.1 Data

This study used annual panel data set that covers the period from 1996 to 2019 for a sample of 11 Asian and 4 North African countries as an emerging market. The 11 Asian countries in the sample are China, India, Indonesia, Iran, Korea, Malaysia, Singapore, Thailand, the Philippines, Turkey, and Vietnam. The remaining 4 North African countries in the sample are Algeria, Egypt, Morocco, and Tunisia. Owing to the non-availability and accessibility of data for all the Asian and North African countries, this study is restricted to the countries as mentioned before with this time period. Following the previous studies of (Azam & Raza, 2018; Clarke et al., 2006; Kim & Lin, 2011; Nguyen et al., 2019; Shahbaz et al., 2015; Younsi & Bechtini, 2018), we consider the Gini coefficient as a standard measure of income inequality, real GDP per capita, and inflation. In line with the recent studies of Azam and Raza (2018), Destek et al. (2020), Svirydzenka (2016), Younsi and Bechtini (2018), we consider four variables of financial development to construct the financial development index, namely, domestic credit to the private sector to GDP ratio, domestic credit to the private sector by banks to GDP ratio, broad money supply or liquid liabilities to GDP ratio, and stock market capitalization to GDP ratio. All data were obtained from the World Development Indicators (WDI) (World Bank, 2019) database. Table A1 (see Appendix) provided an overview of the definitions and sources of all variables used in this study.

3.2 Model Specification

To examine the nonlinear association between economic growth, financial development, and income inequality, we follow Nikoloski (2013), Shahbaz et al. (2015), Jauch and Watzka (2016), Azam and Raza (2018), and Younsi and Bechtini (2018) by estimating the following income inequality equations:

$$\mathrm{INEQ}_{it} = \beta_0 + \beta_1 \mathrm{GDP}_{it} + \beta_2 \mathrm{GDP}_{it}^2 + \beta_3 \mathrm{INF}_{it} + \beta_4 \mathrm{DCB}_{it} + \beta_5 \mathrm{DCB}_{it}^2 + \varepsilon_{it} \quad (1)$$

$$\mathrm{INEQ}_{it} = \beta_0 + \beta_1 \mathrm{GDP}_{it} + \beta_2 \mathrm{GDP}_{it}^2 + \beta_3 \mathrm{INF}_{it} + \beta_4 \mathrm{DCP}_{it} + \beta_5 \mathrm{DCP}_{it}^2 + \varepsilon_{it} \quad (2)$$

$$\mathrm{INEQ}_{it} = \beta_0 + \beta_1 \mathrm{GDP}_{it} + \beta_2 \mathrm{GDP}_{it}^2 + \beta_3 \mathrm{INF}_{it} + \beta_4 \mathrm{LL}_{it} + \beta_5 \mathrm{LL}_{it}^2 + \varepsilon_{it} \quad (3)$$

$$\mathrm{INEQ}_{it} = \beta_0 + \beta_1 \mathrm{GDP}_{it} + \beta_2 \mathrm{GDP}_{it}^2 + \beta_3 \mathrm{INF}_{it} + \beta_4 \mathrm{SMC}_{it} + \beta_5 \mathrm{SMC}_{it}^2 + \varepsilon_{it} \quad (4)$$

$$\mathrm{INEQ}_{it} = \beta_0 + \beta_1 \mathrm{GDP}_{it} + \beta_2 \mathrm{GDP}_{it}^2 + \beta_3 \mathrm{INF}_{it} + \beta_4 \mathrm{FDI}_{it} + \beta_5 \mathrm{FDI}_{it}^2 + \varepsilon_{it} \quad (5)$$

where $i = 1,2,3,\ldots, N$ and $t = 1,2,3,\ldots,$ and T represent the country indicator and the time period, respectively. INEQ is income inequality, as a dependent variable, measured by the Gini coefficient, GDP is the real GDP per capita, INF is inflation rate, DCB is the domestic credit provided by the banking sector to GDP ratio, DCP is the domestic credit provided to the private sector to GDP ratio, LL is the broad money supply or liquid liabilities to GDP ratio, SMC is the stock market capitalization to GDP ratio, FDI is a measure of financial development index, and ε_{it} denotes the error term.

To allow for nonlinearity in the economic growth and income inequality link, a squared term of real GDP per capita (GDP^2) is included in the income inequality equations. As well as to capture the possible nonlinear relationship between financial development proxies and income inequality, we included the squared terms of the financial development proxies (i.e., DCB^2, DCP^2, LL^2, SMC^2, and FDI^2). In Eqs. (1)–(5), if the estimated parameters follow $\beta_1 < 0$ and $\beta_2 > 0$, the relationship between economic growth and income inequality is U-shaped. Otherwise, it is an inverted U-shaped pattern if $\beta_1 > 0$ and $\beta_2 < 0$. When the later condition (i.e., $\beta_1 > 0$ and $\beta_2 < 0$) is confirmed, it indicates an increased connection between economic growth and income inequality in the start stage of economic development, but once an optimal level of economic development is achieved, it becomes a decreasing association, which agrees with the presence of the Kuznets curve hypothesis. Likewise, $\beta_4 < 0$ and $\beta_5 > 0$ indicate the existence of a U-shaped connection between financial development indicators and income inequality. As well as an inverted U-shaped pattern is predicted when the parameters $\beta_4 > 0$ and $\beta_5 < 0$. If this condition (i.e., $\beta_4 > 0$ and $\beta_5 < 0$) is verified, it reveals an increased relationship between financial development and income inequality in the start stage of financial development. Still, once an optimal threshold level of financial development is reached, it becomes a decreasing association, consistent with the financial Kuznets curve hypothesis.

3.3 Method of Estimation

This study chose the fixed effects (FE) model based on the Hausman specification test (Hausman, 1978). The null hypothesis referred to the preferred model as random effects (RE), whereas the alternate hypothesis is that the model is FE. The FE model assumed that the slope coefficients are constant, while the intercept varies across cross-sectional units but not over time (time-invariant) (Greene, 2000). For robustness checks, we used the pooled OLS and system GMM estimators. We choose the pooled OLS regression model because it assumed the intercept and slope coefficients are constant across time/space and the error term captures differences over time and

individuals. In other words, the pooled OLS regression used both the between (individuals) and within (across time) variation to estimate the coefficients consistently. We also chose the system GMM estimator proposed by Arellano and Bover (1995) and Blundell and Bond (1998) because it is a working process to provide consistent and efficient estimates and overcomes the endogeneity problem as well as deals with the unobserved heterogeneity of a country. The system GMM is used upon the difference GMM by including an extra assumption that no correlation is observed between the first differences of instruments. The additional momentum conditions in the system GMM better the accuracy and lower the finite bias of the sample. It was used two diagnostic tests to validate our instruments: the Hansen test of overidentifying restrictions (Hansen, 1982) and the serial correlation AR(2) test (Arellano & Bond, 1991; Blundell & Bond, 1998).

4 Empirical Results

4.1 Descriptive Statistics

Table 1 provides the descriptive data of the variables used in this study from 1996 to 2019. There is considerable variation in the Gini coefficient across countries. For example, the Gini coefficient ranges from 31.065% in Egypt to 45.841% in Malaysia. Real GDP per capita reveals that China ranked first among the 15 selected countries with an average of 8.284, while Iran is ranked last. Financial development indicators also show a large variation. However, domestic credit to the private sector by banks to GDP ratio and domestic credit to the private sector to GDP ratio range from 13.78 and 13.802% in Algeria to 123.991 and 124.084% in China, respectively. Broad money supply or liquid liabilities to GDP ratio range from 44.247% in Indonesia to 162.465% in China. The stock market capitalization to GDP ratio ranges from 0.181% in Algeria to 196.141% in Singapore. Inflation indicates a wide fluctuation varies from a minimum of 1.439% in Singapore to a maximum of 26.736% in Turkey during the sample period.

4.2 Construction of Financial Development Index

We begin our analysis by constructing the financial development index for each country in the sample using PCA analysis. Tables A2 and A3 (see Appendix) present the construction of the financial development index for 11 Asian and 4 North African countries, respectively. As shown in Table A2, the eigenvalues show that the first principal component (PC1) is the best principal component for all the Asian countries. For example, in the case of China, the PCA analysis reveals that the first PC1 explains 78.78% of the standardized variance. The contributions of domestic credit to the private sector by banks to GDP ratio, domestic credit to the private sector to

Table 1 Descriptive statistics for 11 Asian countries and 4 North African countries from years 1996 to 2019

Variables	INEQ		GDP		INF		DCB		DCP		LL		SMC	
Asian countries	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
China	39.853	2.592	8.284	1.922	2.231	2.249	123.991	20.674	124.084	20.578	162.465	28.599	55.514	24.606
India	35.702	4.927	4.967	1.762	6.586	2.959	39.885	11.034	41.184	10.779	67.653	11.127	78.151	27.587
Indonesia	34.730	3.545	3.019	3.814	9.380	10.963	30.368	11.008	35.551	14.025	44.247	7.146	35.407	12.627
Iran	40.438	2.235	1.306	4.756	18.243	8.308	39.508	14.755	39.510	14.754	49.222	14.487	25.243	24.884
Korea	32.309	0.791	3.684	3.061	2.752	1.617	113.414	30.133	113.882	29.277	108.745	33.515	66.992	27.132
Malaysia	45.841	3.901	2.965	3.370	2.391	1.273	120.232	14.522	121.592	16.261	129.545	6.042	140.740	40.968
Philippines	44.885	1.715	3.228	2.035	4.374	2.089	35.285	9.042	36.713	8.074	61.481	7.484	58.036	23.266
Singapore	38.605	2.042	3.037	3.946	1.439	1.786	105.156	14.082	105.753	12.959	115.424	12.896	196.141	53.693
Thailand	40.544	3.322	2.637	3.419	2.504	2.222	108.932	20.745	134.258	17.148	113.297	10.687	68.088	29.147
Turkey	40.935	1.558	3.165	4.277	26.736	27.395	36.247	19.098	57.957	12.919	44.685	8.465	25.917	8.404
Vietnam	36.367	1.185	5.449	0.927	6.151	5.331	77.301	38.412	77.445	38.236	90.297	44.314	36.528	16.296
North African countries														
Algeria	32.575	4.121	1.576	1.710	4.612	3.446	13.779	6.475	13.802	6.476	62.625	14.928	0.181	0.144
Egypt	31.065	1.268	2.526	1.612	9.140	5.889	40.268	11.156	39.630	11.051	83.884	8.967	33.923	27.768
Morocco	38.766	2.634	2.905	2.651	1.583	2.271	53.962	12.679	89.162	3.380	97.325	22.190	55.627	7.427
Tunisia	38.914	3.415	2.531	2.042	3.831	1.295	54.822	7.492	66.593	9.206	59.900	9.661	19.209	4.064
Full Sample	38.102	4.191	3.428	1.605	6.797	6.790	66.211	36.694	73.141	37.847	86.053	33.656	59.713	48.295

Note: Std.Dev: indicates standard deviation; INEQ is income inequality, which is measured by the Gini coefficient; GDP is the real GDP per capita; INF is the inflation rate; DCB is the domestic credit provided by the banking sector as a share of GDP; DCP is the domestic credit provided to the private sector as a share of GDP; LL is the broad money supply or liquid liabilities as a share of GDP; SMC is the stock market capitalization as a share of GDP

Source: World Development Indicators (WDI) 1996–2019

GDP ratio, broad money supply to GDP ratio, and stock market capitalization to GDP ratio to the standardized variance of the first PC1 are 54.96, 54.66, 35.94, and 51.95%, respectively. It was used as the weights to obtain the financial development index for China's economy. The same interpretation is true regarding India, Indonesia, Iran, Korea, Malaysia, Singapore, the Philippines, Thailand, Turkey, and Vietnam.

Regarding the four North African countries, as shown in Table A3, the eigenvalues also reveal that the first principal component (PC1) is the best principal component for all these countries. For instance, for Algeria, the PCA analysis proves that the first PC1 explains about 70.65% of the standardized variance. The individual contributions of domestic credit to the private sector by banks to GDP ratio, domestic credit to the private sector to GDP ratio, broad money supply to GDP ratio, and stock market capitalization to GDP ratio to the standardized variance of the first PC1 (i.e., 58.64, 54.31, 46.28, and 24.63%) were used as the weights to run the financial development index. However, similar results are found in Egypt, Morocco, and Tunisia.

4.3 Cross-Sectional Dependency Results

To test for the existence of cross-sectional dependency in our panel data, we used two methods, Breusch and Pagan (1980) test and Pesaran (2004) test, to check for robustness. The null hypothesis of both tests suggested no cross-sectional dependency among the panel variables. The test results presented in Table 2 allow us to reject the null hypothesis of cross-sectional independence at the 1% significance level. Therefore, there exists a cross-sectional dependency between our variables.

4.4 Panel Unit Root and Panel Cointegration Test Results

After confirming the existence of cross-sectional dependency within our panel data, the next step is to check for stationary properties of the variables. The presence of a unit root is then tested using Levin et al. (2002), Im et al. (2003), the ADF-Fisher chi-square, and the PP-Fisher chi-square (Maddala & Wu, 1999) tests. As shown in Table 3, the null hypothesis of a unit root test cannot be rejected when the variables are taken in level form. In contrast, the unit root null test is strongly rejected at the first-differenced form at the 1% significance level, implying that all the variables are differenced stationary, I(1).

Table 2 Cross-sectional dependency results

Test	Statistic	df	*p*-value
Breusch-Pagan (χ^2)	98.166***	105	0.0000
Pearson LM normal	3.249***		0.0012

Note: *** denotes the level of significance at 1%

Table 3 Panel unit root tests

Method	INEQ	GDP	INF	DCB	DCP	LL	SMC	FDI
LLC (t^*)								
Level	−1.637	0.785	−1.242	1.362	−1.692	0.412	0.452	−0.328
First difference	−6.635***	−5.972***	−3.124***	−5.721***	−5.767***	−3.728**	−4.238***	−4.916***
IPS *(W-stat)*								
Level	−1.527	−1.052	−1.035	1.342	−1.021	0.574	−1.056	−1.036
First difference	−7.553***	−3.298***	−5.021***	−4.579***	−5.432***	−3.938***	−5.129***	−5.112***
ADF-Fisher (χ^2)								
Level	8.953	10.748	12.231	8.375	12.669	11.754	10.521	10.158
First difference	60.145***	52.354***	48.124***	68.793***	70.261***	46.693***	46.248***	46.335***
PP-Fisher (χ^2)								
Level	10.356	12.520	8.336	5.624	8.849	12.482	8.342	7.643
First difference	48.985***	113.951***	116.142***	98.785***	78.552***	48.952***	92.031***	51.645***

Note: LLC denotes Levin et al. (2002) test; IPS denotes Im et al. (2003) test; ADF-Fisher and PP-Fisher denote Maddala and Wu (1999) tests
Null hypothesis LLC: Unit root (assumes common unit root process)
Null hypothesis IPS: Unit root (assumes individual unit root process)
*** denotes rejection of the null of a unit root at 1% significance level

Having confirmed that all the variables are non-stationary and integrated of order one, I(1), we then perform panel cointegration tests using Pedroni cointegration tests (Pedroni, 2004) and Kao cointegration tests (Kao, 1999) to find the long-run cointegrating relationship between the variables. Pedroni (2004) proposed seven statistics to test the null of no cointegration in heterogeneous panels. These tests included two types. The first type of test is based on the within-dimension approach (i.e., panel cointegration statistics), which included four test statistics: panel v-statistic, panel ρ-statistic, panel PP-statistic, and panel ADF-statistic. It gathered the autoregressive coefficients across different members for the unit root tests on the estimated residues. The second type of test is based on the between-dimension approach (i.e., group mean panel cointegration statistics), which included three test statistics: group ρ-statistic, group PP-statistic, and ADF-statistic. Table 4 reports Pedroni and Kao residual panel cointegration tests. The Pedroni's heterogeneous panel cointegration tests results show that the null hypothesis of no cointegration is significantly rejected except for the panel v-statistic, the panel ρ-statistic, and the group ρ-statistic. Similarly, the results of the Kao residual panel cointegration test show the rejection of the null hypothesis of no cointegration at the 1% significance level. Thus, these tests allow us to infer that there is a long-run cointegrating relationship between the variables.

4.5 Fixed Effects Panel Regression Analysis

After establishing a long-run association between the predictor and criterion variables, the next step is related to the coefficients of the cointegrating relationship estimation. The long-run effects of real GDP per capita, inflation, and financial development indicators on income inequality have been estimated using FE regressions. However, before estimating the long-run effects of the variables, we must first test both cross-sectional and period effects in the FE estimates. To do this, we used the Wald test, where the first null hypothesis is that there is no cross-sectional effect. The second null is that there is no period effect. The F-statistic values and the associated p-values (p-value < 0.0001) strongly rejected the first null hypothesis that cross-sectional effects are absent and the second null that the period effects are absent. It implies that the variables are heterogeneous across countries and over time. Moreover, we have computed the Wu-Hausman statistic for exogenous properties of the models. The null hypothesis rejection indicates that there are endogenous regressors in the models. The statistic values show that the null cannot be rejected (p-value > 0.1). Hence, it can be infer that there are no endogenous regressors in our models. It indicates that the estimators are unbiased and consistent and that the specified panel regression models are not misspecified.

After confirming the absence of cross-sectional effects and period effects and the exogenous properties in our panel data models, the next step involves estimating the FE regression models. The five specifications' estimation yield the results reported in Table 4. The explanatory powers are high in all models. The high adjusted R-squared

Table 4 Pedroni and Kao (Engle-Granger based) panel cointegration tests

	Pedroni residual cointegration test							Kao residual cointegration test
	Alternative hypothesis: common AR coefficients (within-dimension)				Alternative hypothesis: individual AR coefficients (between-dimension)			
Model specification	Panel v-statistic	Panel ρ-statistic	Panel PP-statistic	Panel ADF-statistic	Group ρ-statistic	Group PP-statistic	Group ADF-statistic	ADF-statistic
INEQ $= f$(GDP, GDP^2, INF, DCB, DCB^2)								
Statistic	−0.986	0.558	−2.280***	−1.992***	1.485	−5.570***	−1.762***	−8.726***
Prob.	(0.655)	(0.369)	(0.001)	(0.001)	(0.785)	(0.000)	(0.001)	(0.0001)
INEQ $= f$(GDP, GDP^2, INF, CDP, CDP^2)								
Statistic	−1.542	0.463	−2.281**	−2.295***	1.996	−1.682	−2.251**	−12.514***
Prob.	(0.414)	(0.249)	(0.011)	(0.000)	(0.655)	(0.234)	(0.046)	(0.0001)
INEQ $= f$(GDP, GDP^2, INF, SMC, SMC^2)								
Statistic	0.643	−1.428	−5.262***	−1.543**	−0.568	−6.775***	−1.385*	−9.934***
Prob.	(0.332)	(0.072)	(0.000)	(0.038)	(0.164)	(0.000)	(0.084)	(0.0001)
INEQ $= f$(GDP, GDP^2, INF, LL, LL^2)								
Statistic	−1.480	0.539	−4.576***	−3.889***	2.054	−3.795***	−1.968**	−10.422***
Prob.	(0.356)	(0.342)	(0.000)	(0.000)	(0.768)	(0.000)	(0.033)	(0.0001)
INEQ $= f$(GDP, GDP^2, INF, FDI, FDI^2)								
Statistic	0.514	0.485	−2.719***	−3.575***	1.561	−3.332***	−3.549***	−11.128***
Prob.	(0.183)	(0.241)	(0.000)	(0.000)	(0.736)	(0.000)	(0.000)	(0.0001)

Note: The null hypotheses of Pedroni and Kao (Engle-Granger based) residual panel cointegration tests are that the variables are not cointegrated
***, **, and * denote the level of significance at 1%, 5%, and 10%, respectively

indicates that income inequality is well clarified by long-run autonomous factors: real GDP per capita, inflation, and financial development indicators. Insofar as financial development indicators tend to be highly correlated, each of such indicators is introduced separately to Eqs. (1)–(5) in Table 5. Our empirical results show that financial development indicators and economic growth variables positively impact income inequality. As shown in Columns (1) to (5) of Table 5, it seems that the estimated long-run coefficients of real GDP per capita are positive and statistically significant at the 5% significance level in all FE regressions. In comparison, its squared terms have a negative and statistically significant impact on income inequality at the 1% and 5% significance levels, respectively. This result implies that, in the long-term, increasing in real income per capita reduces income inequality. It reveals an inverted U-shaped relationship between economic growth and income inequality. We can confirm the validity of the Kuznets curve hypothesis. Our results agree with the findings of Rehman et al. (2008), Shahbaz (2010), Park and Shin (2017), and Younsi and Bechtini (2018). In contrast, our results contradict the findings of Piketty and Saez (2003) study in the USA, Shahbaz and Islam (2011) study in Pakistan, Delbianco et al. (2014) study in Latin America, and Shahbaz et al. (2017) study in Kazakhstan.

Regarding financial development indicators, our results show that all the coefficients of financial development indicators (i.e., DCB, DCP, LL, SMC) and financial development index (FDI) is positive and statistically significant at the 1% and 5% significance levels, respectively. In comparison, the coefficients of its squared terms are negatively significant at the 1% and 5% levels, respectively. It showed that a 1% increase in domestic credit to the private sector by banks to GDP ratio, domestic credit to the private sector to GDP ratio, broad money supply to GDP ratio, stock market capitalization to GDP ratio, and financial development index significantly lead to a decrease in income inequality by 0.185%, 0.124%, 0.242%, 0.136%, and 0.163%, respectively. This result confirms a long-run positive relationship between overall financial development indicators and income inequality. It reveals an inverted U-shaped relationship between overall financial development indicators and income inequality. We can then deduce the Kuznets curve's validity hypothesis for overall financial development indicators and the financial development index. Our findings are agreed with Clarke et al. (2006), Rehman et al. (2008), Jalil and Feridun (2011), Shahbaz and Islam (2011), Kim and Lin (2011), Rötheli (2011), Nikoloski (2013), Shahbaz et al. (2015), Zhang and Cheng (2015), Jauch and Watzka (2016), Azam and Raza (2018), and Younsi and Bechtini (2018), who have predicted an inverted U-shaped relationship between these financial development indicators and income inequality. However, our findings contradicted the findings that have been reported for India by Ang (2010), for 22 African countries by Batuo et al. (2010), for Pakistan by Shahbaz and Islam (2011), for Vietnam by Hoi and Hoi (2012), for Kazakhstan by Satti et al. (2015), and for Malaysia by Mansur and Azleen (2017).

Moreover, our findings indicate that inflation significantly impacts income inequality in all specifications. It implies that maintaining a low and stable inflation rate can improve economic growth and financial development, thereby mitigating

Table 5 Income inequality regressions (full sample)

	Fixed effects (FE)					Pooled ordinary least squares (OLS)					Generalized method of moment (GMM)				
Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12	Model 13	Model 14	Model 15
GDP	0.496** (0.043)	0.212** (0.031)	0.356** (0.024)	0.472** (0.028)	0.465** (0.033)	0.369** (0.041)	0.205** (0.031)	0.336** (0.021)	0.295** (0.20)	0.461** (0.032)	0.305* (0.068)	0.396* (0.072)	0.297* (0.059)	0.225* (0.064)	0.449* (0.078)
GDP^2	−0.006*** (0.000)	−0.004*** (0.000)	−0.006*** (0.000)	−0.005*** (0.000)	−0.004*** (0.000)	−0.006*** (0.002)	−0.004*** (0.001)	−0.006*** (0.003)	−0.004*** (0.001)	−0.004*** (0.003)	−0.004** (0.017)	−0.004** (0.025)	−0.005** (0.022)	−0.004** (0.031)	−0.003** (0.028)
INF	0.378*** (0.000)	0.557*** (0.000)	0.415*** (0.000)	0.395*** (0.000)	0.468*** (0.000)	0.480*** (0.001)	0.554*** (0.000)	0.431*** (0.000)	0.472*** (0.001)	0.463*** (0.001)	0.212** (0.059)	0.543*** (0.001)	0.338*** (0.001)	0.385*** (0.002)	0.465** (0.071)
DCB	0.185** (0.034)					0.192** (0.031)					0.168*** (0.003)				
DCB^2	−0.008** (0.022)					−0.008** (0.020)					−0.006* (0.064)				
DCP		0.124** (0.060)					0.139** (0.033)					0.153*** (0.004)			
DCP^2		−0.006** (0.032)					−0.006* (0.078)					−0.005*** (0.002)			
LL			0.242** (0.076)					0.285** (0.037)					0.234*** (0.003)		
LL^2			−0.007*** (0.003)					−0.007* (0.066)					−0.005** (0.032)		
SMC				0.136*** (0.003)					0.205*** (0.002)					0.132*** (0.001)	
SMC^2				−0.004*** (0.002)					−0.004** (0.031)					−0.003* (0.071)	
FDI					0.163*** (0.001)					0.162*** (0.001)					0.149*** (0.002)
FDI^2					−0.004** (0.012)					−0.004** (0.011)					−0.003** (0.010)
Constant	4.591*** (0.000)	5.311*** (0.000)	5.292*** (0.000)	4.695*** (0.000)	4.926*** (0.000)	5.655*** (0.000)	5.278*** (0.000)	5.562*** (0.000)	4.985*** (0.000)	4.896*** (0.000)	4.622*** (0.000)	5.778*** (0.000)	4.452*** (0.000)	5.838*** (0.000)	4.495*** (0.000)

Hausman test	35.742*** (0.000)	38.554*** (0.000)	28.985*** (0.000)	24.996*** (0.000)	48.643*** (0.000)										
Wu-Hausman test	3.238 (0.583)	2.336 (0.867)	2.585 (0.695)	2.998 (0.972)	2.955 (0.774)										
Adj. R^2	0.595	0.522	0.551	0.585	0.592	0.596	0.538	0.559	0.537	0.595					
F-statistic	23.984*** (0.000)	26.132*** (0.000)	13.244*** (0.000)	18.835*** (0.000)	12.446*** (0.000)	33.728*** (0.000)	26.132*** (0.000)	15.359*** (0.000)	30.438*** (0.000)	12.445*** (0.000)					
AR(2) test											(0.354)	(0.228)	(0.798)	(0.285)	(0.236)
Hansen-J test											(0.835)	(0.971)	(0.943)	(0.932)	(0.984)

Note: *p*-values are in parentheses; the AR(2) test is the Arellano-Bond test for second-order serial correlation in disturbances; the null hypothesis of the Hansen test is overidentifying restrictions are valid

***, **, and * denote the level of significance at 1%, 5%, and 10%, respectively

income inequality in the studied Asian and North African countries. This finding is agreed by Azam and Raza (2018) for five selected ASEAN countries (Indonesia, Malaysia, the Philippines, and Singapore) and Younsi and Bechtini (2018) for BRICS countries (Brazil, Russia, India, China, and South Africa).

4.6 Pooled OLS and System GMM Estimation Analysis

To avoid the problem of endogeneity when the lagged endogenous is included as a regressor, with this aim, two different methods have been used: the pooled OLS and the system GMM estimators to test for the sensitivity of our initial results estimated with the FE regression models. The pooled OLS and system GMM estimates reported in Columns (6) to (15) of Table 5 provide interesting insights to support robust decision-making about the long-run effects of financial development and real GDP per capita on income inequality.

The pooled OLS regression models show that the goodness of fit is relatively high in all specifications. The coefficients of real GDP per capita and inflation with overall financial development indicators are significant with expected signs in all specifications. However, the real GDP per capita coefficients reveal a significant positive impact on income inequality at the 5% level, although the coefficients of its squared terms are negative and statistically significant at the 1% level. It implies that the long-run relationship between real GDP per capita and income inequality is nonlinear. Therefore, our results show strong evidence of an inverted U-shaped relationship between economic growth and income inequality. Besides, we confirm that the linear terms of overall financial development indicators exhibit significant positive impacts on income inequality, but the squared terms exhibit their significant negative impacts. However, the significant threshold effect in the financial development–inequality nexus implies that the long-run link between financial development and income inequality is nonlinear. This result emphasizes an inverted U-shaped relationship between income inequality and overall financial development proxies in Asian and North African countries under study. Moreover, we find that inflation has a significant positive impact at the 1% significance level. It concludes that these results are quite similar to the results estimated with FE regression models.

Moreover, to examine whether our initial findings are robust for endogeneity, we use the system GMM estimators. The estimated long-run coefficients are reported in Table 5 (Columns (11) to (15)). The diagnostic analysis indicates that the Hansen J-statistics cannot reject the null hypothesis of instrument validity. The value of the autoregressive parameter is also higher in the system GMM. In all cases, the Arellano-Bond test for AR(2) serial correlation indicates no serial correlation of significance in the AR(2) term. On the long-run dynamic relationship between financial development, economic growth, and income inequality, it is shown that the results are robust to different financial development indicators and real GDP per capita. It shows an inverted U-shaped relationship between overall financial development indicators and income inequality in the long run. The validity of an inverted

U-shaped connection between economic growth and income inequality is also confirmed.

4.7 Panel Granger Causality Tests

We use panel Granger causality to test long-run causal relationships among the variables. Table 6 reports the results of the panel Granger causality tests. Regardless of which proxy of financial development is used, it shows evidence of a long-run unidirectional causality relationship running from overall the proxies of financial development (i.e., DCB, DCP, LL, SMC) to income inequality. The unidirectional causal relationship runs from the financial development index (FDI) to income inequality. While a bidirectional causal relationship runs from inflation to income inequality and from income inequality to inflation. These results reinforce the findings of Gimet and Lagoarde-Segot (2011), Huang and Kao (2011), Shahbaz et al. (2015), Azam and Raza (2018), and Younsi and Bechtini (2018), who suggested that financial sector development plays its vital in decreasing income inequality. The Granger causality tests also reveal unidirectional causality running from income inequality to economic growth. This result is in line with Risso and Carrera (2012) and disagreed with Shahbaz et al. (2015), who predicted bidirectional causality from income inequality to economic growth in Iran. However, there is no causality running from economic growth to income inequality. This finding confirms the findings that have been reported for five ASEAN countries by Azam and Raza (2018) and for BRICS countries by Younsi and Bechtini (2018).

Table 6 Panel Granger causality tests

Null hypothesis	Lags	*F*-statistic	*p*-value
GDP does not Granger cause INEQ	1	1.842	0.160
INEQ does not Granger cause GDP	1	7.960***	0.004
INF does not Granger cause INEQ	1	3.364**	0.036
INEQ does not Granger cause INF	1	4.596**	0.011
DCB does not Granger cause INEQ	1	8.542***	0.002
INEQ does not Granger cause DCB	1	1.305	0.258
DCP does not Granger cause INEQ	1	7.962***	0.001
INEQ does not Granger cause DCP	1	1.024	0.415
LL does not Granger cause INEQ	1	6.751***	0.001
INEQ does not Granger cause LL	1	1.052	0.312
SMC does not Granger cause INEQ	1	5.291*	0.054
INEQ does not Granger cause SMC	1	1.563	0.312
FDI does not Granger cause INEQ	1	3.942**	0.058
INEQ does not Granger cause FDI	1	1.925	0.146

Note: The optimal lag is conducted using the Akaike and Schwarz information criteria

5 Conclusion and Policy Implications

Using panel dataset of 11 Asian and 4 North African countries over the period 1996–2019, this study examined whether economic growth and financial development affect income inequality. Various tests for stationarity, cointegration and causality, and robust estimation methods were applied. The study confirms a long-run cointegrating relationship between the variables. The FE, pooled OLS, and system GMM estimators reveal a significant growth threshold effect in the inequality–growth nexus. It implies that the long-run rise in real income per capita reduces inequality. There is evidence of an inverted U-shaped relationship between economic growth and income inequality. Our findings also indicate a significant financial development threshold effect in the financial development–income inequality nexus, revealing that increasing financial development proxies reduce income inequality in the long-run. This result shows an inverted U-shaped relationship between overall proxies of financial development and income inequality. The study confirms the validity of the Kuznets curve hypothesis. Moreover, the panel Granger causality test results support a long-run unidirectional causal link leading from overall the financial development proxies to income inequality. While there is evidence of a long-run unidirectional causality from income inequality to growth, implying that income inequality negatively affected economic growth. The results also show no causality running from economic growth to income inequality.

Overall, our findings have practical implications for creating money-based policies to enhance access to financial support and financial instruments for secure equal opportunities for the poor and low-income sectors to develop their businesses. Governments must devise fiscal policies and thereby progressive taxes to reduce income inequality, especially in Asian and North African countries. Governments can also improve financial access by fostering competition between financial intermediaries, which leads to better allocational efficiency. Besides, financial sector institutions should support investment in the health and education sectors. The governments should also support inclusive development covering rural development policies, including financial services and income tax policies. Moreover, the decision-makers should also improve an institutional quality that reduces income inequality.

Nonetheless, this study has two significant limitations. First, due to the scarcity and incomplete data on fiscal policy, social transfer, and government expenditure, this research could not explore the impact of these variables on income inequality. Second, the effect of volatility of economic growth and stock market indicators (i.e., market capitalization ratio; turnover ratio; value traded ratio) on income inequality remains unexplored in this study.

Finally, future research on the finance–inequality nexus could be done with a broader and updated dataset on other factors catching the financial development in terms of quality including the financial sector size, efficiency, stability, volatility, and level of access to finance, with a focus on specific income groups.

Appendix

Table A1 Variables identifications

Variables	Proxies	Measurement	Data sources
Dependent variable			
Income inequality	INEQ	Income inequality that is measured by the Gini coefficient	WDI, World Bank (2019)
Independent variables			
Economic growth	GDP	The real gross domestic product (GDP) per capita measured in constant 2010 US$ as a proxy for economic growth	WDI, World Bank (2019)
Inflation	INF	Inflation is measured by the consumer price index, as annual % (CPI) to account for the macroeconomic instability	WDI, World Bank (2019)
Stock market capitalization	SMC	The total value of listed shares divided by GDP, which refers the capital market's development of any economy	WDI, World Bank (2019)
Broad money supply or liquid liabilities	LL	Broad money supply or liquid liabilities as a share of GDP, which represents the sum of currency outside banks; demand deposits other than those of the central government; the time, savings, and foreign currency deposits of resident sectors other than the central government; bank and traveller's checks; and other securities such as certificates of deposit and commercial paper	WDI, World Bank (2019)
Private sector credit	CDP	Domestic credit to the private sector as a share of GDP refers to financial resources provided to the private sector by financial corporations, such as loans, purchases of nonequity securities, and trade credits and other accounts receivable that establish a claim for repayment	WDI, World Bank (2019)
Bank credit	DCB	The banking sector provides domestic credit (e.g., loans, purchases of nonequity securities, trade credits, and other received accounts). It refers to financial resources provided to the private sector by other depository corporations (deposit-taking corporations except for central banks)	WDI, World Bank (2019)

Table A2 construction of financial development index for 11 Asian countries

China	Eigenvalues (Sum = 4, Average = 1)					Eigenvectors (loadings)				
Number	Value	Difference	Proportion	Cumulative value	Cumulative proportion	Variable	PC1	PC2	PC3	PC4
1	2.9513	2.0372	0.7878	2.9513	0.7878	DCB	0.5496	−0.0428	−0.5879	−0.5919
2	0.9141	0.8129	0.1785	3.8654	0.9664	DCP	0.5466	−0.2122	−0.2494	0.7706
3	0.1012	0.0678	0.0253	3.9666	0.9917	LL	0.3594	0.9077	0.2073	0.06214
4	0.0334	-------	0.0083	4.0000	1.0000	SMC	0.5195	−0.3594	0.7410	−0.2276
India										
1	2.8217	1.7556	0.7054	2.8217	0.7054	DCB	0.5838	−0.0100	−0.6143	0.5306
2	1.0661	0.9990	0.2665	3.8878	0.9720	DCP	0.5862	0.0173	−0.1332	−0.7989
3	0.0671	0.0221	0.0168	3.9549	0.9887	LL	0.3733	0.7419	0.5183	0.2035
4	0.0451	-------–	0.0113	4.0000	1.0000	SMC	0.4196	−0.6701	0.5797	0.1967
Indonesia										
1	2.3549	1.2339	0.5887	2.3549	0.5887	DCB	0.4545	−0.4576	0.7551	0.1181
2	1.1211	0.6328	0.2803	3.4760	0.8690	DCP	0.6346	−0.1034	0.2039	0.7383
3	0.4883	0.4526	0.1221	3.9643	0.9911	LL	0.6142	0.0648	0.4331	−0.6565
4	0.0357	-------–	0.0089	4.0000	1.0000	SMC	0.1165	0.8808	0.4480	0.0997
Iran										
1	2.8084	1.7214	0.7021	2.8084	0.7021	DCB	0.5899	−0.0134	−0.3194	−0.7414
2	1.0870	1.0085	0.2718	3.8954	0.9739	DCP	0.5881	0.0222	−0.4592	0.6654
3	0.0785	0.0525	0.0196	3.9739	0.9935	LL	0.3697	0.7373	0.5640	0.0378
4	0.0261	-------–	0.0065	4.0000	1.0000	SMC	0.4115	−0.6750	0.6074	0.0779
Korea										
1	2.6692	1.4716	0.6673	2.6692	0.6673	DCB	0.6008	−0.0030	−0.4613	0.6528
2	1.1976	1.1021	0.2994	3.8668	0.9667	DCP	0.6019	0.0632	−0.2740	−0.7474
3	0.0955	0.0579	0.0239	3.9623	0.9906	LL	0.2940	0.7870	0.5314	0.1085
4	0.0376	-------–	0.0094	4.0000	1.0000	SMC	0.4361	−0.6136	0.6555	0.0590
Malaysia										
1	2.5106	1.4824	0.6277	2.5106	0.6277	DCB	0.6195	−0.0698	−0.1651	0.7643

2	1.0282	0.6010	0.2571	3.5389	0.8847	DCP	0.5760	0.1411	−0.5630	−0.5756
3	0.4273	0.3934	0.1068	3.9661	0.9915	LL	0.5316	−0.1501	0.7870	−0.2746
4	0.0339	-------–	0.0085	4.0000	1.0000	SMC	0.0428	0.9761	0.1906	0.0956
Philippines										
1	2.8290	2.0348	0.7072	2.8290	0.7072	DCB	0.5701	−0.2604	0.1384	−0.7668
2	0.7942	0.4513	0.1985	3.6231	0.9058	DCP	0.5387	−0.3221	0.4966	0.5996
3	0.3429	0.3089	0.0857	3.9660	0.9915	LL	0.5203	0.0282	−0.8223	0.2288
4	0.0340	-------–	0.0085	4.0000	1.0000	SMC	0.3378	0.9097	0.2410	−0.0143
Singapore										
1	2.6953	1.6792	0.6738	2.6953	0.6738	DCB	0.6012	−0.0467	0.1513	0.7833
2	1.0161	0.7564	0.2540	3.7114	0.9279	DCP	0.5775	−0.0110	0.5950	−0.5589
3	0.2598	0.2310	0.0649	3.9712	0.9928	LL	0.5491	0.1693	−0.7755	−0.2616
4	0.0288	-------–	0.0072	4.0000	1.0000	SMC	0.0595	0.9844	0.1472	0.0760
Thailand										
1	2.4304	1.5006	0.6076	2.4304	0.6076	DCB	0.6172	−0.2645	−0.0789	−0.7368
2	0.9297	0.2996	0.2324	3.3601	0.8400	DCP	0.5717	−0.2334	−0.4902	0.6152
3	0.6302	0.6205	0.1575	3.9903	0.9976	LL	0.4765	0.1256	0.8287	0.2653
4	0.0097	-------–	0.0024	4.0000	1.0000	SMC	0.2554	0.9273	0.2581	−0.0913
Turkey										
1	2.9482	2.0072	0.7371	2.9482	0.7371	DCB	0.5654	−0.0750	−0.7850	−0.2415
2	0.9411	0.8593	0.2353	3.8893	0.9723	DCP	0.5682	−0.1046	0.5921	−0.5617
3	0.0818	0.0529	0.0204	3.9711	0.9928	LL	0.5724	−0.1187	0.1802	0.7910
4	0.0288	-------–	0.0072	4.0000	1.0000	SMC	0.1725	0.9845	0.0248	0.0172
Vietnam										
1	2.5096	1.4761	0.6329	2.5096	0.6329	DCB	0.5885	−0.0813	−0.1733	0.7496
2	1.0335	0.6107	0.2518	3.5431	0.8847	DCP	0.5596	0.1624	−0.5811	−0.5568
3	0.4228	0.3887	0.1065	3.9659	0.9912	LL	0.5165	−0.1762	0.8072	−0.2649
4	0.0341	-------–	0.0088	4.0000	1.0000	SMC	0.0536	0.9971	0.2134	0.0782

Table A3 construction of financial development index for 4 North African countries

Algeria	Eigenvalues (Sum = 4, Average = 1)					Eigenvectors (loadings)				
Number	Value	Difference	Proportion	Cumulative value	Cumulative proportion	Variable	PC1	PC2	PC3	PC4
1	2.5378	1.6651	0.7065	2.5378	0.7065	DCB	0.5864	−0.2575	−0.0759	−0.6999
2	1.0221	0.2434	0.2514	3.5599	0.9579	DCP	0.5431	−0.2273	−0.4658	0.5845
3	0.4054	0.5683	0.0336	3.9653	0.9915	LL	0.4628	0.1195	0.7875	0.2535
4	0.0347	--------	0.0085	4.0000	1.0000	SMC	0.2463	0.8896	0.2452	−0.0867
Egypt										
1	2.6982	1.6941	0.7083	2.6982	0.7083	DCB	0.5531	−0.2498	0.1315	−0.7228
2	1.0041	0.7420	0.2037	3.7023	0.9120	DCP	0.5172	−0.3092	0.4718	0.5696
3	0.2621	0.2265	0.0792	3.9644	0.9912	LL	0.5094	0.0270	−0.7812	0.2174
4	0.0356	--------	0.0088	4.0000	1.0000	SMC	0.3248	0.8873	0.2291	−0.0135
Morocco										
1	2.4685	1.4273	0.6159	2.4685	0.6159	DCB	0.5835	−0.4395	0.7248	0.1245
2	1.0412	0.5858	0.2521	3.5097	0.8680	DCP	0.5648	−0.1013	0.2357	0.7552
3	0.4554	0.4205	0.1238	3.9651	0.9918	LL	0.4531	0.0622	0.4538	−0.6725
4	0.0349	--------	0.0082	4.0000	1.0000	SMC	0.1356	0.8568	0.4276	0.1028
Tunisia										
1	2.5183	1.4941	0.6355	2.5183	0.6355	DCB	0.5891	−0.0449	0.1695	0.7406
2	1.0242	0.6002	0.2526	3.5425	0.8881	DCP	0.5595	−0.0156	0.5628	−0.4995
3	0.4240	0.3905	0.1041	3.9665	0.9922	LL	0.5382	0.1598	−0.6937	−0.2863
4	0.0335	--------	0.0078	4.0000	1.0000	SMC	0.0583	0.9676	0.1545	0.0669

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Board Diversity and Bank Outcomes in India

Shreya Biswas and Arnab Mukherjee

Abstract In this chapter we consider the gender, age, tenure and educational diversity of listed bank boards in India during 2015–2019. We find that banks have a very low share of young directors below the age of 45 years. Also, the representation of females on bank boards is around 10% suggesting that females do not constitute a critical mass in bank boards. Our analysis does not find any evidence that bank board diversity is related to the performance of banks given by ROA. However, having a higher share of directors with economics, finance or management education is related to lower credit risk of banks given by gross non-performing assets to total advances and net non-performing assets to total advances ratios. Further, we find that for public sector banks (PSBs) in India, higher share of directors with tenure more than 10 years and higher share of directors who are more than 65 years old are detrimental for the asset quality of banks. Our findings suggest banks in India, especially PSBs, should voluntarily thrive towards a demographically diverse board to reap the economic benefits of board diversity.

Keywords Bank · Board of directors · Diversity · Gender diversity · Age diversity · Educational diversity · Tenure diversity · Corporate governance · Governance reform · Performance · Credit risk · Non-performing assets · Private banks · India

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1 Introduction

The need for diversity in corporate boardrooms has caught the attention of policymakers in the last decade. Several countries like Spain, Norway, Finland, India and others have introduced regulations pertaining to the representation of women on corporate boards. However, other aspects of demographic diversity have received lesser attention. A recent article by Creary et al. (2019) based on interviews with 19 board members of top companies in the United States highlights the need to expand the notion of boardroom diversity by including other aspects of diversity like ethnicity, nationality and age diversity in addition to gender diversity. Further, their survey revealed that diversity may not be directly related to board performance or profitability of firms, but does improve board culture. However, it was highlighted that a diverse board might not add value unless the board is egalitarian and not hierarchical. Given that companies these days compete in international markets and the nature of business is becoming complex, the need to have a board representing people from various backgrounds has become more important than ever.

In this chapter, we consider whether demographic diversity of boards matter for banks in the context of an emerging market economy like India. India is a bank-based economy, and well-governed banks remain the necessary condition for efficient allocation of capital to various stakeholders of the economy. As per the Companies Act, 2013, all listed banks in India are mandated to have at least one female director on their board. However, there are no specific regulations for other aspects of board diversity. Given that banks are highly leveraged institutions and are heavily regulated, the experience of non-financial firms cannot be generalized for banks. At the same time, having a demographically diverse bank board enables banks to better understand the nature of risk faced by various companies to which it extends credit (Aggarwal et al., 2019; Ararat et al., 2015). Also, a diverse board can improve the strategic advice provided by the board to the management of the bank.

Further, in the Indian banking sector, there are 12 large state-owned banks currently in India.[1] The boards of state-owned banks are known to be hierarchical in its structure where the directors nominated by the government often have a stronger voice compared to others. In such boards, the effectiveness of diversity remains ambiguous. In this chapter, in addition to gender diversity, we consider age, tenure and education as aspects of board diversity with respect to banks in India.

The remaining of the chapter is organized as follows. Section 2 discusses the literature on board diversity and firm outcomes. Section 3 provides an overview of the Indian banking sector and the corporate governance challenges faced by the sector. Section 4 presents the data and variables, and Sect. 5 elaborates the methodology followed in the study. Section 6 discusses the results, and Sect. 7 concludes the chapter.

[1] https://rbi.org.in/scripts/banklinks.aspx (Accessed on June 21, 2021).

2 Why Diversity Matters?

Robinson and Dechant (1997) discuss the importance of diversity in workplaces. First, a diverse workforce improves creativity and innovation. Second, diverse workers exhibit superior problem-solving ability. Third, diversity in the workforce improves the effectiveness of corporate leadership. Fourth, ethnoculturally diverse workforce helps firms to obtain a competitive edge in different markets. Finally, a diverse team helps in understanding the expectations of a diverse customer base. Forbes and Milliken (1999) find that the demographic characteristics can affect the behaviour and decision-making process of the board. In the last decade, several studies have examined whether demographic diversity of board is related to firm outcomes in various settings.

The theoretical link between board diversity and firm outcomes can be explained by the resource dependence theory (Pfeffer & Salancik, 1978) or the agency theory (Jensen & Meckling, 1976). The resource dependence theory of the board suggests that a diverse board will provide access to a large pool of resources and bring in legitimacy. This view suggests that board diversity is desirable as directors belonging to a diverse background will make board decision-making process more meaningful. On the other hand, the agency theory emphasizes the monitoring role of the board. As per this view, diverse board is less likely to collude and hence will be better able to monitor the manager on behalf of the shareholders of the firm.

In the context of boards, several studies have examined the effect of diversity on firm level outcomes. Carter et al. (2003) and Erhardt et al. (2003) were the early ones to find empirical evidence that the percentage of women and the percentage of racial minorities on the board are positively related to firm performance given by the market measure and accounting measures, respectively. Later, Miller and Triana (2009) find that a racially diverse board is related to higher innovation given by the R&D intensity of Fortune 500 firms and also enhances the reputation of the firm in the marketplace. Through the channel or innovation and reputation, board diversity improves the firm performance. Other studies found either a negative effect or no effect of diversity on outcomes. Adams and Ferreira (2009) find that gender diversity harms the profitability of the firms even though they find that female directors are better monitors. Carter et al. (2010) did not find any relation between gender and ethnic diversity of boards and firm performance in the context of firms in the United States.

In the past few years, many studies have examined the role of gender diversity of boards in affecting firm outcomes. The burgeoning literature specific to gender diversity can be attributed to the fact that many countries like Norway, Spain, Canada, Finland, Kenya, India and others have introduced regulations pertaining to the representation of females on corporate boards. In addition to performance, studies have found that higher female representation on board is related to better earnings quality (Arun et al., 2015; Srinidhi et al., 2011), higher employee productivity (Ali et al., 2014), higher stock liquidity and lower cost of capital (Ahmed & Ali, 2017) and lower financial manipulation (Wahid, 2019).

Table 1 Summary of prominent studies analysing the relation between board diversity and bank outcomes

Authors	Country setting	Board diversity	Findings
Pathan and Faff (2013)	United States	Gender diversity	Importance of gender diversity for bank performance feel in the post SOX period
Berger et al. (2014)	Germany	Age, gender and educational diversity	Younger executive directors and female directors increase the risk of banks and higher PhD holders on board reduces bank risk
Gulamhussen and Santa (2015)	OECD countries	Gender diversity	Higher share of females on board improve performance and reduces risk-taking behaviour of banks
Farag and Mallin (2017)	European Union	Gender diversity	Representation of females above a threshold reduces the financial vulnerability of banks
Ghosh (2017)	India	Gender diversity	Women on bank board reduce profitability but improves financial stability
Owen and Temesvary (2018)	United States	Gender diversity	U-shaped related between female representation on bank boards and performance
Talavera et al. (2018)	China	Age diversity	Age diversity is detrimental for bank performance

However, few studies have also highlighted the importance of other aspects of board diversity, including age, education and tenure. The age of the director is likely to be related to cognitive ability. In the context of Korean firms, Kim and Lim (2010) find that directors with academic majors and younger directors are related to superior firm value. Other studies find that older executives with valuable experience are less likely to explore new strategies (Joshi et al., 2011), whereas younger directors are more likely to take risk (Ahn & Walker, 2007; Berger et al., 2014). Talavera et al. (2018) find a negative relation between age diversity of board members and bank profitability. On the other hand, Rose (2007) finds no such relation between the education level of the directors and firm performance. Research on the contribution of the tenure of directors on firm outcome is inconclusive. For example, Joshi et al. (2011) find that tenure diversity is positively related to firm's strategic outcomes, while other studies document an inverted U-shaped relationship between director tenure and strategic change (Golden & Zajac, 2001; Huang & Hilary, 2018).

Additionally, a handful of studies have examined the relationship between composite board diversity index and firm outcomes. Ararat et al. (2015) find a positive relation between board diversity on account of gender, age, education and nationality with firm performance for Turkish firms. Recently, Aggarwal et al. (2019) find that demographic diversity of boards is positively related to the performance of stand-alone firms in India and is negatively related to the performance of Indian business group firms.

Table 1 summarizes a few prominent studies that have analysed the relation of board diversity and bank outcomes. The extant literature on board diversity and bank

outcomes in the context of emerging market economies is relatively scarce. Further, most of the studies have considered the gender diversity of the board and its relation to bank outcomes. Given the complex nature of bank operations and the dearth of studies in emerging markets considering various aspects of board diversity, we specifically examine the role of the demographic diversity of boards in affecting the performance and credit risk of banks in India.

3 Indian Banking Landscape

The Indian banking industry currently consists of 12 **public** sector banks, 22 **private** sector banks and 44 foreign banks. The banking industry in India is undergoing consolidation since 2019, and the number of public sector banks has reduced from 27 to 12 owing to mergers. The industry for long was dominated by public sector banks (PSBs) where Government of India (GOI) is the majority shareholder. The PSBs in India account for around 61% of the total banking asset in the financial year 2019 (RBI, 2019). The banks are regulated by the central bank, Reserve Bank of India. Additionally, the PSBs are also regulated by the Ministry of Finance and are mandated to provide access to cheap capital to small enterprises along with financial inclusion objectives.

The Indian banking sector is grappling with twin problems of rising non-performing assets and muted credit growth during the last decade. The gross non-performing assets (GNPA) ratio for the banks in 2019 was around 8.5% with GNPA of 11% for PSBs and around 4.5% for private banks in India (RBI, 2019). The banking industry dealing with financial fragility needs to have strong boards along with a focused management to overcome such difficult times. However, during the same period, the banks in India are facing several corporate governance challenges as highlighted by the Nayak committee report (2014). The report emphasizes that the governance challenges of PSBs and private banks significantly differ. In PSBs, there is a need to professionalize the appointment of directors on the board of PSBs and reduce operational interference by the GOI. Further, the compensation structure of directors sitting on PSBs is not incentive-compatible, reducing the pool of skilled directors applying for board positions in PSBs. Also, the report highlights the need to appoint younger directors and increase the demographic diversity of boards. Recently, Acharya and Rajan (2020) emphasize the need to encourage lateral hiring of directors on the boards of PSBs to strengthen the board composition and improve board effectiveness of PSBs. Also, the GoI appoints many directors on the board of PSBs who cannot be considered truly independent.

On the other hand, the governance challenges surrounding the board are very different. First, for old private banks, the directors belonging to the founder family tend to have a significant influence on board decisions. The extent to which the board is independent of the controlling shareholder's influence remains questionable in a few private banks in India. There is also a threat that the monitoring ability of boards of private banks is constrained by the executive autonomy of the CEO. Additionally,

in presence of central bank imposed regulatory restrictions regarding the structure of compensation that can be paid to directors of banks, the pool of directors that can be attracted by private banks is limited. Further, the minimum age for the appointment of directors on the board of a private bank is 35 years, unlike 21 years for PSBs, and the rationale for separate requirements remains unclear.

The governance challenges and the regulations differ across PSBs and private banks in India which suggests that the role of the demographic diversity of boards can have different relation for PSBs and private banks.

4 Data and Variables

The board-level data for the banks is obtained from the India Boards database maintained by the Prime database during 2015–2019. The sample period corresponds to the period for which the board level information is available from the India Boards database. The database provides information regarding the board composition of National Stock Exchange-listed firms in India including banks. It contains demographic information like date of birth, gender and educational qualifications of the directors. Additionally, information is provided regarding the years since which the director is associated with a company. There are 5747 director year level observations in our study.

The financial information for the 36 listed banks in India during 2015–2019 is obtained from the Prowess database maintained by the Centre for Monitoring Indian Economy. Prowess contains the information regarding the financial performance of all listed and unlisted companies from the audited annual reports of companies and information from the Ministry of Company Affairs and Reserve Bank of India. Appendix (Table A1) provides the names of banks in our study along with their ownership classification. Appendix (Table A2) provides the break-up of year-wise bank and director level observations used in the study.

4.1 Dependent Variable

We specifically consider two bank outcomes – profitability and asset quality measures. The profitability of banks is given by the accounting measure of performance, i.e. return on assets (ROA). The ROA of banks is defined as the profit after tax divided by the total assets of the banks. The ROA is a widely used measure of profitability in bank studies (Cabo et al., 2012; Rafinda et al., 2018). Further, asset quality measures are indicators of the credit risk of banks (Grove et al., 2011). We consider gross net performing assets to total advances (GNPA) and net non-performing assets to total advances (NNPA) as the two asset quality measures in our study.

4.2 Board Diversity Variable

In this study, we capture board diversity based on four specific dimensions, i.e. age, gender, tenure and education. We define gender diversity as the share of female directors on the board (Sh_F). The educational diversity of the board is given by the share of directors on the board with economics, finance or management degrees (Sh_educ). The age of the director captures the overall experience of the director as well as the ability to adapt to newer industry practices. The relation between age and outcomes is not likely to be linear. We consider the share of directors who are below 45 years (Sh_age_ $<$ 45). A higher share of young directors is likely to bring in a newer perspective but also lack experience. Next, we consider the share of directors in the age group of 45–65 years (Sh_age_45–65). The higher share of middle-aged directors on board having several years of experience is likely to be valuable for the banks. Finally, the share of old directors on the board is given by the number of directors over 65 years divided by the board size (Sh_age_ $>$ 65). The older directors will have wide experience but are less likely to bring in newer ideas to the board. With respect to tenure, we consider the share of directors with less than 5 years of tenure with the bank (Sh_tenure_ $<$ =5), the share of directors with 5 to 10 years of tenure with the bank (Sh_tenure_6–10) and the share of directors with more than 10 years of tenure (Sh_tenure_ $>$ 10). Very long tenure with the bank can potentially represent close ties with the top management team and can become a weak monitor. On the other hand, a very short tenure may represent a modest understanding regarding the complex functioning of banks, reducing the effectiveness of monitoring and strategic advice provided by the directors.

4.3 Control Variables

As discussed in the earlier section, the private banks in India function differently from the public sector banks owing to regulatory restrictions, differences in objectives and also variation in governance standards. The private banks in India are more profitable and have lower non-performing assets. On account of the difference in bank outcomes owing to ownership structure, we control for this in our specification by introducing a private dummy that takes the value one for private banks and zero otherwise. In addition to ownership of bank, in line with the literature, we control for other factors like bank size given by logarithm of total assets, cost of funds given by logarithm of total deposits and advances and net interest margin, the capital structure of banks and board size (Berger et al., 2014).

5 Methodology

We employ a pooled regression wherein the bank outcome is regressed on board diversity and other control variables along with year dummies given by the equation below:

$$Y_{\text{it}} = \alpha + \beta \text{Diversity}_{\text{it}} + \delta X_{\text{it}} + \delta \text{Public}_i + \gamma_t + \varepsilon_{\text{it}} \quad (1)$$

where Y_{it} refers to bank outcomes—ROA, GNPA, NNPA. The variable $Diversity_{it}$ is the share of the attribute k (age, gender, tenure and education) in the board for bank i in year t and the BDI variable. A significant β will suggest that there is a positive association between board diversity and bank outcomes. On other hand, an insignificant relation would suggest that even though diversity is desirable from a stakeholder's point of view, it may not have direct bearing on financial outcomes of banks and may not affect shareholders. $Public_i$ is a dummy variable that takes the value one if the bank is PSB and zero otherwise. X_{it} is the set of bank level controls in our models. Additionally, we report heteroscedasticity and autocorrelation consistent standard errors.

Further, given that private and public sector banks have different objectives and board effectiveness is likely to vary across the public sector and private banks in India, one can argue that the average effect of board diversity on bank outcome will not capture the heterogeneity in ownership structure. We also examine whether ownership of banks plays a moderating role in board diversity and bank outcome relation by introducing an interaction between $Diversity_{it}$ and $Private_i$ dummies in Eq. (1) and re-estimate the models.

6 Findings

6.1 Univariate Analysis

Figure 1a presents the trend in diversity variables during 2015–2019. The shares of females on board have throughout remained below 10% level without much change. It appears that the female directors on bank boards may not be constituting a critical mass and their relations with bank outcomes remain ambiguous. Around 50% of the directors on bank boards have an educational degree in economics, management or finance degrees. Interestingly, the age of directors with less than 5 years of tenure and those with less than 10 years of tenure with the bank has shown a modest downward trend during the period. On the other hand, the share of directors with more than 10 years of tenure has increased from 25.6% in 2015 to 41.7% in 2019. Having a higher percentage of directors with a very long tenure may not be very desirable from the shareholder's perspective. These directors can be close to the top management teams and are less likely to flag any observations making them weak

monitors. On the contrary, it is also possible that having more directors with longer tenure will make them better strategic advisors as these directors are likely better to understand the bank-specific risks and its business model. The share of old directors (above 65 years) has consistently been close to 50% of the board, indicating that the average age of bank boards is quite high. Figure 1b presents the trend separately for

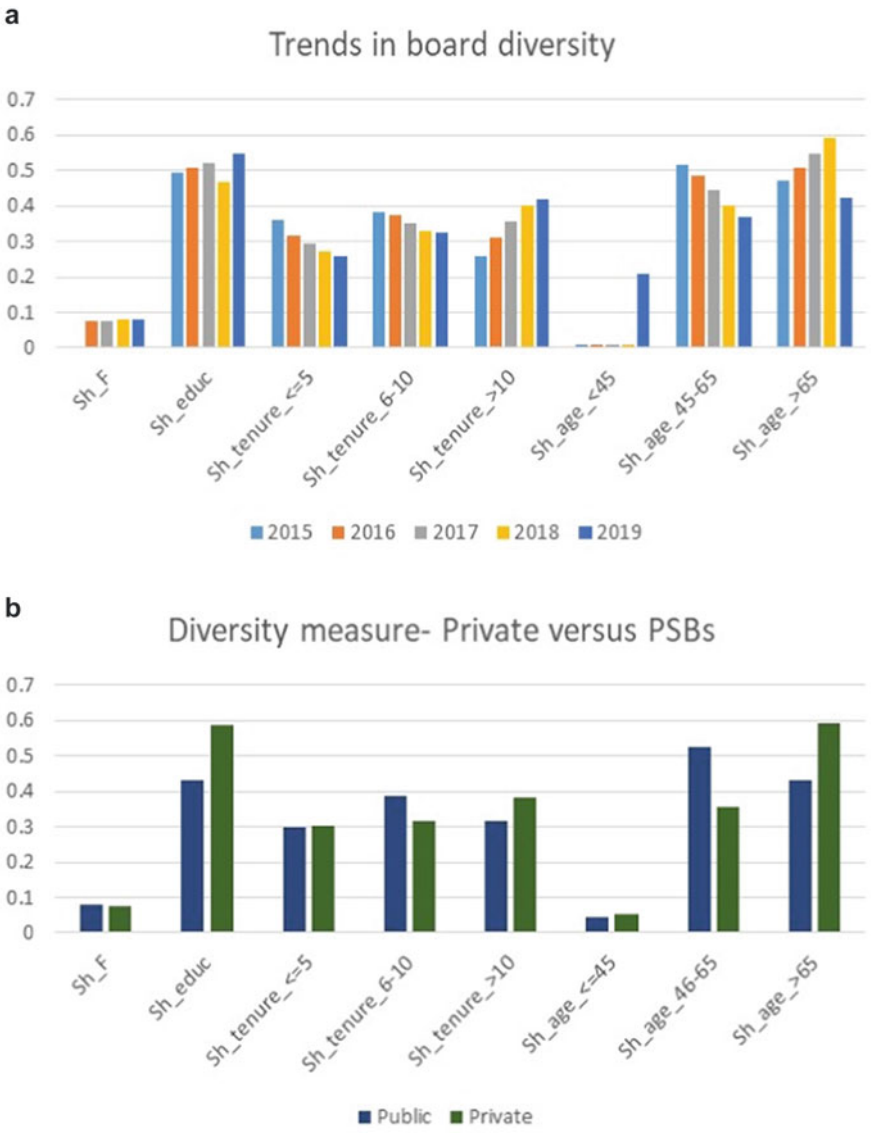

Fig. 1 Bank board diversity measures. (**a**) Board diversity during 2015–2019. (**b**) Board diversity for PSBs and private banks

Table 2 Mean of bank characteristics during 2015–2019

Variable	2015	2016	2017	2018	2019	2015–2019
ROA	0.007	0.003	0.004	−0.002	−0.002	0.002
GNPA	0.041	0.069	0.092	0.114	0.104	0.085
NNPA	0.024	0.044	0.053	0.063	0.045	0.046
Board	35.441	37.706	39.771	41.306	44.056	39.726
Size	14.500	14.498	14.541	14.399	14.308	14.447
Debt-equity ratio	1.107	1.176	1.222	1.225	1.115	1.169
NIM	2.835	2.853	2.903	3.185	3.233	3.002
Deposit	14.851	14.847	14.892	14.751	14.823	14.832
Public	0.529	0.529	0.514	0.500	0.500	0.514
Observations	34	34	35	36	36	175

PSBs and private banks in India. We do not find any differences in gender diversity across PSBs and private banks. However, private banks have younger boards and boards with a higher share of directors with less than 10 years of experience. This observation supports the notion that PSBs in India are facing severe corporate governance challenges (Acharya & Rajan, 2020).

Table 2 represents year-wise and the overall mean of the dependent and the control variables in the analysis. We find that the ROA of the banks has been under downward pressure during this period, and the non-performing assets have been increasing (GNPA as well as NNPA).

Table 2 presents the year-wise and overall mean of performance, asset quality and other bank characteristics.

Table 3 gives the mean of the variables separately for PSBs and private banks. We observe that the private banks have outperformed the PSBs in India during this period both in terms of ROA and asset quality measures. The PSBs are much larger and have larger boards. The PSBs in India manage significantly higher deposits but have lower NIM. However, the leverage ratio does not differ based on the ownership of banks. The summary statistics indicate that board diversity can potentially have different associations for private and PSBs in India.

Table 3 presents the year-wise and overall mean of performance, asset quality and other bank characteristics separately for the public sector banks (PSBs) and for private banks.

The correlation between diversity variables and the dependent variables are given in Table 4. There is a positive albeit weak correlation between the share of females on board and performance and credit risk of the banks. The share of directors with a relevant educational degree is positively correlated with ROA and negatively correlated with non-performing assets. It suggests that having more directors with degrees in economics, finance or management could be desirable for bank outcomes. Contrary to our expectation, we find that the share of old directors and share of directors with less than 5 years of tenure is positively correlated to ROA and negatively correlated to the non-performing asset ratios. The univariate correlation analysis suggests that we need to consider a multivariate regression framework to understand

Table 3 Bank characteristics during 2015–2019: public versus private banks

	2015		2016		2017		2018		2019	
Variables	PSB	Private	PSB	Private	PSB	Private	PSB	Private	PSB	Private
ROA	0.003	0.011***	−0.003	0.009***	−0.001	0.009***	−0.012***	0.008	−0.011***	0.006
GNPA	0.056***	0.027	0.101***	0.034	0.135***	0.048	0.173***	0.057	0.148***	0.057
NNPA	0.034***	0.013	0.066***	0.019	0.079***	0.026	0.094***	0.032	0.063***	0.028
Board	45.667***	23.938	48.500***	25.563	51.944***	26.882	54.833***	27.778	57.333***	30.778
Size	15.003***	13.934	14.982***	13.953	15.021***	14.032	14.979***	13.819	15.053***	13.563
Debt-equity ratio	1.075	1.144	1.218	1.128	1.160	1.288	1.363	1.087	1.216	1.013
NIM	2.389	3.524***	2.398	3.498***	2.301	3.706***	2.319	4.183***	2.509	4.125***
Deposit	15.367***	14.270	15.347***	14.285	15.383***	14.372	15.359***	14.144	15.420***	14.190
Observations	18	16	18	16	18	17	18	18	18	18

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

Table 4 Correlation between bank outcomes and board diversity measures

	ROA	GNPA	NNPA	Sh_F	Sh_educ	Sh_tenure_ < =5	Sh_tenure_6–10	Sh_tenure_ > 10	Sh_age_ < 45	Sh_age_45–65	Sh_age_ > 65	Board	Size	Debt-equity ratio	NIM	Deposit	Public
ROA	1.00																
GNPA	−0.83	1.00															
NNPA	−0.76	0.94	1.00														
Sh_F	0.03	0.16	0.1	1.00													
Sh_educ	0.42	−0.52	−0.57	−0.04	1.00												
Sh_tenure_ < =5	0.21	−0.22	−0.15	−0.04	−0.21	1.00											
Sh_tenure_6–10	−0.26	0.16	0.23	−0.03	−0.24	−0.22	1.00										
Sh_tenure_ > 10	−0.01	0.08	−0.02	0.05	0.3	−0.73	−0.51	1.00									
Sh_age_ < 45	−0.08	0.08	−0.01	−0.08	0.07	−0.19	0.05	0.14	1.00								
Sh_age_45–65	−0.26	0.18	0.24	−0.03	−0.26	0.31	0.17	−0.39	−0.31	1.00							
Sh_age_ > 65	0.31	−0.22	−0.23	0.08	0.21	−0.17	−0.20	0.29	−0.36	−0.78	1.00						
Board size	−0.73	0.73	0.67	0.11	−0.44	−0.09	0.17	−0.05	0.02	0.40	−0.40	1.00					
Size	−0.18	0.26	0.21	0.26	−0.02	−0.15	−0.02	0.15	−0.15	0.16	−0.06	0.58	1.00				
Debt-equity ratio	−0.07	0.01	−0.02	0.04	0.11	−0.16	−0.03	0.17	−0.05	−0.01	0.05	0.14	0.35	1.00			
NIM	0.67	−0.60	−0.62	0.06	0.29	0.17	−0.44	0.16	0.05	−0.32	0.28	−0.65	−0.28	−0.12	1.00		
Deposit	−0.21	0.28	0.22	0.26	−0.04	−0.15	−0.01	0.13	−0.15	0.18	−0.08	0.61	0.99	0.32	−0.30	1.00	
Public	−0.69	0.71	0.71	−0.01	−0.067	0.05	0.34	−0.28	−0.05	0.54	−0.50	0.86	0.38	0.04	−0.67	0.41	1.00

the association between various aspects of board diversity and bank outcomes during the period after controlling for other covariates.

Table 4 provides the pairwise correlation between banks characteristics and board diversity variables.

6.2 Regression Results

First, we assess whether board diversity is related to the accounting performance of the bank given by ROA (Table 5). The coefficient of share of females and share of

Table 5 Relation between board diversity and ROA

	Dependent variable: ROA			
	(1)	(2)	(3)	(4)
Sh_F	***0.006***			
	(0.023)			
Sh_educ		***0.003***		
		(0.006)		
Sh_tenure_6–10			***−0.008***	
			(0.008)	
Sh_tenure_ > 10			***−0.007***	
			(0.006)	
Sh_age_45–65				***−0.008***
				(0.007)
Sh_age_ > 65				***−0.007***
				(0.007)
Board size	−0.000***	−0.000***	−0.000***	−0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Size	0.009	0.012	0.111***	0.010
	(0.013)	(0.012)	(0.011)	(0.012)
Debt-equity ratio	−0.001	−0.001	−0.001	−0.001
	(0.001)	(0.001)	(0.001)	(0.001)
NIM	0.005***	0.005***	0.004***	0.005***
	(0.001)	(0.001)	(0.001)	(0.001)
Deposits	−0.006	−0.009	−0.008	−0.007
	(0.013)	(0.012)	(0.012)	(0.012)
Public	−0.002	−0.000	−0.002	−0.002
	(0.003)	(0.003)	(0.003)	(0.003)
Constant	−0.031**	−0.030**	−0.026*	−0.024*
	(0.013)	(0.013)	(0.014)	(0.014)
Year FE	Y	Y	Y	Y
Observations	141	141	141	141
R-squared	0.731	0.731	0.733	0.733

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

directors with relevant education is positive but insignificant at usual levels of significance. On the other hand, the coefficients of share of directors with higher tenure and those belonging to the older cohort are negative even though insignificant. In our analysis for the period 2015–2019, we do not find that gender, educational, age or tenure diversity of bank boards was related to bank profitability in India. Our findings suggest that board diversity is a desirable attribute; however, it is not directly linked to the performance measure of banks.

Table 5 provides the output from regression of ROA on various aspects of demographic diversity of the board along with bank controls and year fixed effects. The standard errors are in parentheses.

Next, we assess the relationship between the demographic aspects of the board and asset quality of banks. Column 1 of Table 6 indicates that a higher share of

Table 6 Relation between board diversity and GNPA

	Dependent variable: GNPA			
	(1)	(2)	(3)	(4)
Sh_F	***0.281*** **			
	(0.123)			
Sh_educ		***−0.069*** **		
		(0.029)		
Sh_tenure_6–10			***−0.019***	
			(0.046)	
Sh_tenure_ > 10			***0.065****	
			(0.036)	
Sh_age_45–65				***−0.036***
				(0.040)
Sh_age_ > 65				***0.012***
				(0.038)
Board size	0.001	0.001**	0.001*	0.001**
	(0.001)	(0.001)	(0.001)	(0.001)
Size	0.099	0.143**	0.168***	0.169***
	(0.068)	(0.062)	(0.061)	(0.061)
Debt-equity ratio	−0.006	−0.010*	−0.010*	−0.009*
	(0.006)	(0.005)	(0.005)	(0.005)
NIM	−0.019***	−0.021***	−0.019***	−0.017***
	(0.004)	(0.005)	(0.005)	(0.004)
Deposits	−0.106	−0.147**	−0.177***	−0.177***
	(0.069)	(0.063)	(0.063)	(0.063)
Public	0.056***	0.026	0.063***	0.063***
	(0.015)	(0.019)	(0.015)	(0.015)
Constant	0.163**	0.199***	0.222***	0.219***
	(0.070)	(0.068)	(0.074)	(0.074)
Year FE	Y	Y	Y	Y
Observations	134	134	134	134
R-squared	0.743	0.743	0.742	0.741

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

females on board is related to higher GNPA on an average. Column 2 suggests that a higher share of directors with relevant educational degrees is associated with a lower GNPA at 5% level of significance. This finding is according to the resource dependence view of the board that suggests that the qualification of the director can have a bearing on the resource pool available to the bank. Further, we find that tenure diversity does not affect GNPA at 5% level of significance (column 3). However, we find that increase in the share of directors with more than 10 years tenure is positively related to GNPA of the banks at 10% level of significance. This provides a weak evidence in favour of the agency view that very long tenure can make the directors weaker monitors and is not desirable for the shareholders. Finally, we do not find any evidence that age diversity is related to GNPA of banks.

Table 6 provides the output from regression of GNPA on various aspects of demographic diversity of the board along with bank controls and year fixed effects. The standard errors are in parentheses.

Table 7 presents the results of regressing NNPA on diversity variables, and the results are qualitatively similar to the relationship between board diversity measures and GNPA. A higher share of females increases the average NNPA of banks (column 1), and a higher share of directors with relevant education reduces the NNPA of banks (column 2). Tenure and age diversity turns out to be unrelated to NNPA of banks at both 5% and 10% level of significance (columns 3 and 4). Overall our results are closely related to the findings of Berger et al. (2014) wherein they find that having a higher share of females on board increases the risk of banks and more directors with Ph.D. reduces the risk of German banks. We also find that Indian banks facing an increasing non-performing asset problem need to look at the educational diversity of boards for better strategic advice and superior board monitoring. Our overall findings support the view that the demographic diversity of the board generates economic benefits for the banks in the form of lower credit risk. Further, we do not find any evidence that the mandatory representation of females on board is likely to improve bank outcomes in India.

Table 7 provides the output from regression of NNPA on various aspects of demographic diversity of the board along with bank controls and year fixed effects. The standard errors are in parentheses.

As discussed earlier, the operations of private and PSBs in India appear to be different. In order to analyse whether ownership acts as a moderating variable in our board diversity and bank outcome regressions, we introduce an interaction between *public* dummy and the diversity measure and re-estimate Eq. 1. Similar to the main result, we find that diversity is largely unrelated to ROA of both PSBs and private banks (Columns 1–4, Table 8). However, a higher share of directors with relevant educational degrees appears to be related to higher ROA of PSBs. Further, we observe that for asset quality measures, the negative relation between the non-performing assets ratio and educational diversity is mostly driven by PSBs. Again, for PSBs, we find that higher tenure of directors is related to poor asset quality at 5% level of significance. This finding is line with the agency theory and suggests that long tenure can reduce board effectiveness. However, this finding does not support

Table 7 Relation between board diversity and NNPA

	Dependent variable: NNPA			
	(1)	(2)	(1)	(2)
Sh_F	***0.192******			
	(0.069)			
Sh_educ		***−0.047*****		
		(0.016)		
Sh_tenure_6–10			***−0.008***	
			(0.026)	
Sh_tenure_ > 10			***0.019***	
			(0.020)	
Sh_age_45–65				***−0.019***
				(0.022)
Sh_age_ > 65				***−0.009***
				(0.022)
Board size	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Size	0.056	0.087**	0.103***	0.102***
	(0.038)	(0.035)	(0.035)	(0.035)
Debt-equity ratio	−0.004	−0.006**	−0.006**	−0.006**
	(0.003)	(0.003)	(0.003)	(0.003)
NIM	−0.013***	−0.014***	−0.013***	−0.012***
	(0.002)	(0.002)	(0.003)	(0.003)
Deposits	−0.063	−0.091**	−0.109***	−0.108***
	(0.039)	(0.036)	(0.036)	(0.036)
Public	0.037***	0.017*	0.038***	0.036***
	(0.008)	(0.010)	(0.009)	(0.009)
Constant	0.134***	0.155***	0.167***	0.171***
	(0.039)	(0.038)	(0.042)	(0.043)
Year FE	Y	Y	Y	Y
Observations	141	141	141	141
R-squared	0.725	0.726	0.712	0.711

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

the proposition of Nayak Committee (2014) that highlights that the tenure of directors sitting on boards of PSBs should increase.

7 Conclusion and Discussion

Diversity in the workplace is a desirable attribute in modern-day workplaces, including banks. Currently, except for the representation of at least one female on board of listed companies, there is no other regulatory requirement regarding the

Table 8 Relation between board diversity and ROA: public versus private banks

	ROA				GNPA				NNPA			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Sh_F	0.044				0.127				0.107			
	(0.033)				(0.176)				(0.099)			
Sh_educ		−0.005				−0.000				−0.003		
		(0.007)				(0.035)				(0.020)		
Sh_tenure_6–10			−0.005				−0.027				−0.015	
			(0.009)				(0.045)				(0.028)	
Sh_tenure_ > 10			0.006				−0.064*				−0.034	
			(0.007)				(0.036)				(0.022)	
Sh_age_45–65				−0.011				0.013				−0.011
				(0.008)				(0.042)				(0.024)
Sh_age_ > 65				−0.006				−0.014				−0.032
				(0.008)				(0.038)				(0.022)
Public	0.006	−0.011*	0.026**	−0.006	0.025	0.117***	−0.164***	0.073	0.020	0.072***	−0.063*	−0.000
	(0.006)	(0.006)	(0.012)	(0.011)	(0.030)	(0.033)	(0.056)	(0.053)	(0.017)	(0.018)	(0.035)	(0.031)
Sh_F*Public	***−0.077***				***0.315***				***0.172***			
	(0.048)				***(0.258)***				***(0.144)***			
Sh_educ*Public		***0.021****				***−0.170*****				***−0.103*****		
		(0.010)				***(0.052)***				***(0.029)***		
Sh_tenure_6–10*Public			***−0.034***				***0.234****				***0.111****	
			(0.021)				***(0.100)***				***(0.062)***	
Sh_tenure_ > 10*Public			***−0.048*****				***0.446*****				***0.187*****	
			(0.014)				***(0.067)***				***(0.042)***	
Sh_age_45–65*Public				***0.009***				***−0.104****				***0.001***
				(0.012)				***(0.057)***				***(0.034)***

(continued)

Table 8 (continued)

	ROA				GNPA				NNPA			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Sh_age_ > 65*Public				***−0.001***				***0.101****				***0.083****
				(0.011)				***(0.056)***				***(0.033)***
Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	141	141	141	141	134	134	134	134	141	141	141	141
R-squared	0.736	0.740	0.756	0.736	0.746	0.764	0.816	0.780	0.728	0.751	0.753	0.738

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

This table provides the output from regression of ROA on various aspects of demographic diversity and diversity and public dummy interaction along bank controls and year fixed effects. The standard errors are in parentheses.

demographic composition of boards. In this chapter, we analyse whether board diversity generates economic benefits for the bank and its shareholders in India during 2015–2019 period. We find that the share of directors below the age of 45 years is meager in banks highlighting the need to appoint younger directors who are likely to bring in fresh perspectives. Further, the representation of females on bank boards is less than 10% suggesting that women may not be forming a critical mass to influence decision-making. Additionally, we find that tenure of directors is longer in private banks compared to PSBs in India. The share of directors with degrees in economics, finance or management is greater in private banks vis-à-vis PSBs in India.

Our analysis suggests that board diversity is unrelated to the accounting performance of banks. However, we do find evidence that having skilled directors proxied by higher share of directors with relevant experience is associated with lower non-performing assets. Further, we also find that the relationship between board diversity and outcomes is not homogenous for PSBs and private banks. For the PSBs, a higher share of directors with relevant education can improve their asset quality, reinforcing the need to reform the appointment of directors on boards of PSBs in India. This finding is in line with recommendations of Nayak Committee (2014) that board appointments should be professionalized and lateral hiring for PSBs should be introduced. Also, a high share of directors above the age of 65 years is also negatively related to asset quality of PSBs suggesting the need to hire younger directors on board. Finally, unlike the recommendation of the Nayak Committee (2019), we find that longer tenure of board members adversely affects the asset quality of PSBs. Our results broadly suggest that there are benefits associated with demographically diverse boards and banks should voluntarily adopt diversity in its hiring process to reap its positive spillovers.

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Appendix

Table A1 List of banks with the ownership classification

	Banks	Ownership type
1	ALLAHABAD BANK	PUBLIC
2	ANDHRA BANK	PUBLIC
3	AXIS BANK LTD.	PRIVATE
4	BANDHAN BANK LTD.	PRIVATE
5	BANK OF BARODA	PUBLIC
6	BANK OF INDIA	PUBLIC
7	BANK OF MAHARASHTRA	PUBLIC
8	CANARA BANK	PUBLIC
9	CENTRAL BANK OF INDIA	PUBLIC
10	CITY UNION BANK LTD.	PRIVATE
11	CORPORATION BANK	PUBLIC
12	D C B BANK LTD.	PRIVATE
13	DHANLAXMI BANK LTD.	PRIVATE
14	FEDERAL BANK LTD.	PRIVATE
15	H D F C BANK LTD.	PRIVATE
16	I C I C I BANK LTD.	PRIVATE
17	I D B I BANK LTD.	PRIVATE
18	INDIAN BANK	PUBLIC
19	INDIAN OVERSEAS BANK	PUBLIC
20	INDUSIND BANK LTD.	PRIVATE
21	JAMMU & KASHMIR BANK LTD.	PRIVATE
22	KARNATAKA BANK LTD.	PRIVATE
23	KARUR VYSYA BANK LTD.	PRIVATE
24	KOTAK MAHINDRA BANK LTD.	PRIVATE
25	LAKSHMI VILAS BANK LTD.	PRIVATE
26	ORIENTAL BANK OF COMMERCE	PUBLIC
27	PUNJAB & SIND BANK	PUBLIC
28	PUNJAB NATIONAL BANK	PUBLIC
29	R B L BANK LTD.	PRIVATE
30	SOUTH INDIAN BANK LTD.	PRIVATE
31	STATE BANK OF INDIA	PUBLIC
32	SYNDICATE BANK	PUBLIC
33	UCO BANK	PUBLIC
34	UNION BANK OF INDIA	PUBLIC
35	UNITED BANK OF INDIA	PUBLIC
36	YES BANK LTD.	PRIVATE

Table A2 Year-wise bank and director level observations in the study

Year	No. of banks	No. of directors
2015	34	1205
2016	34	1282
2017	35	1392
2018	36	1487
2019	36	1586

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Dynamics of Industrial Production, Financial Development and Carbon Emission in Nigeria

David Oluseun Olayungbo, Adenike Anike Olayungbo, and Samuel Omoniyi

Abstract This study focused on the dynamic relationship among industrial production, financial development and carbon emission in Nigeria. Annual data set from 1960 to 2018 was employed. A long-run relationship was found for the variables of interest, while the (ECM) term suggested small and insignificantly 2% per year adjustment of short run to long run, which supported the short-run insignificant effects of both industrial production and financial development on carbon emission. The long-run result showed positive and significant effect of industrial production on carbon emission, while the long-run effect of financial development on carbon emission was negative and also significant. The causality results showed unidirectional causalities with causalities running from both industrial production and emission to financial development. We therefore concluded that industrial production increases emission, while financial development reduces it in Nigeria. We recommended that the industrial sector should adopt non-renewable energies in its production processes, while Nigeria's financial authorities and institutions should channel funds to projects that support low emission in order to achieve the proposed low-carbon economy.

Keywords Industrial production · Financial development · Carbon emission · ECM · Granger causality test · Nigeria

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1 Introduction

Nigeria, being the Africa's largest producer of oil and the sixth largest oil-producing country in the world, emits high amount of carbon emissions traceable to oil production from gas flaring and those generated from burning of fossil fuels from oil companies, power plants, cement factories and automobiles (Isa, 2014; Stephen, 2014). The development of the industrial sector occasioned by financial development has led to increase in energy consumption, especially fossil fuels with detrimental environmental effects (Gokmenoglu et al., 2015). Apart from air pollution caused by carbon emission, there are other climatic damages that are detrimental to human lives and sustenance. Such environmental impacts are flood, diseases, drought in some climates, less precipitation that can lead to heat or hot weather in others, reduction in soil fertility that reduces food supply and ecosystem damages, among others.

The oil and gas exploration activities in Nigeria involve the burning of large quantities of natural gas, a phenomenon referred to as gas flaring (Isa, 2014). Nigeria contributes about 13% of the gas flared globally every year as a result of a daily oil production of about an average of two million barrels per day (International Energy Agency, 2014). Cement production is another major source of carbon emissions in the country, and other sources of carbon emissions include fumes from fairly used cars, plants and small power generators, which are imported in large quantities due to inconsistent supply of electricity in the country (Stephen, 2014).

Consequently, the Environmental Performance Index (2014) of the Yale University ranked Nigeria 134 out of 178 countries with a score of 39.20%. In addition, the Energy Sustainability Index (2014) of the World Energy Council, which ranks countries in terms of their likely ability to provide sustainable energy policies ranked Nigeria 11th position in energy security; 108th position in energy equity; and 81st position in environmental sustainability out of 111 countries. The foregoing reveals that Nigeria, as a member of Organization of Petroleum Exporting Countries (OPEC), contributes to the global warming with the industrial sector as its major source. The industrial output in Nigeria consists of crude petroleum, natural gas, solid minerals, coal mining, metal ores, quarrying, mining, manufacturing oil refining and cement (Central Bank of Nigeria, CBN, 2014).

Nigeria has become the largest economy in Africa with the current recalculation of her gross domestic product (GDP) of US$415,080 billion (equivalent to ₦130.854 trillion using the current exchange rate of ₦315.25 to $1) (International Monetary Fund (IMF), 2016). Nigeria has now been ranked ahead large African countries like Egypt, South Africa and Algeria. The growth of Nigeria's economy is attributed to oil production as it provides over 95% of export earnings, 25% to GDP, 90% of foreign exchange earnings and about 90% of government revenues (IMF, 2012). In the same vein, oil production has been identified as one of the major sources of carbon emission. Rowlands (2000) asserts that the world oil consumption is responsible for over 25% of green gas emission (GHG) in the globe.

Due to climate change caused by environmental consequence of carbon emission, the Kyoto Protocol 2015 Paris Conference of the United Nations Framework Convention on Climate Change (UNFCCC) committed the industrialized countries and oil-producing countries to reduce the global temperature by an average of 5.2% (Jeppesen & Folmer, 2001). This is necessary to pursue a sustainable development in a manner that fosters low greenhouse gas emissions and makes finance flows consistent with a pathway towards low emission and climate-resilient development (UNFCCC, 2015).

Nigeria, as a part of the 192 countries that are parties to the Kyoto Protocol, is now committed to climate change policy that promotes low-carbon economy. The country is currently working towards ending gas flaring by 2030, targeting off-grid solar photovoltaic (PV) of 13 gigawatt (13,000Mega Watt), maintaining 2% per year energy efficiency, shifting from car to mass transit transportation, adopting clean technology in oil exploration and ensuring climate smart agriculture and reforestation, among others (Nigerian Federal Ministry of Environment, 2015). Furthermore, the integration of the green financed policy alongside with environmental policy in recent time is another great initiative on the part of the Nigerian government to promote financial investment to renewable energy, energy efficiency, agricultural development and other clean energy ventures. Nigeria is a host to a number of Clean Development Mechanism (CDM) projects and those financed by the Adaptation Fund. All the environmental initiatives and policies are evidence and pointers to the fact that Nigeria, as a treaty to the Kyoto Protocol, is committed to becoming a low-carbon economy in the nearest future. It is therefore pertinent to examine the role of financial intermediation in industrial emissions through loan advancement. Table 1 shows that financial development, industrial production and carbon emission have been growing in Nigeria over time.

However, there is a dearth of empirical studies on the interaction of industrial production, financial development and carbon emissions specifically for oil-producing countries. Zhang (2011) has established for China that financial development acts as an important driver of carbon emission increase. In addition, most empirical studies have focused on the relationship between financial development and economic growth (Anthony et al., 2015; Esso, 2010; Goldsmith, 1969; Jalil & Ma, 2008; Ndebbio, 2004; Ngongang, 2015; Nkoro & Uko, 2013; Samargandi

Table 1 Financial development, industrial production and carbon emission in Nigeria

Year	Financial Dev.	Industrial prod.	Carbon emission
1960	109.33	134	3406.64
1970	351.7	912.5	21,539.96
1980	7457.80	20,174.65	68,154.86
1990	35,436.80	115,591.37	45,375.46
2000	596,001.50	2,359,313.30	79,181.53
2010	10,157,021.20	12,033,196	85,221.10
2014	17,128,980	18,402,191	88,026.30
2018	23,536,260	33,218,329.65	97,000.90

Source: CBN (2019)

et al., 2014; Schumpeter, 1911), while other studies have considered the relationship between financial development and industrial production (Ekor & Adeniyi, 2012; Imoughele et al., 2013; Neusser & Kugler, 1998; Qing et al., 2014; Udoh & Ogbuagu, 2012). In contrast with this study, Mehrara and Musai (2012); Li et al. (2015); and Hamisu et al. (2015) studied the relationship among financial development, carbon emissions and economic growth. Finally, Gokmenoglu et al. (2015) investigated the relationship among industrialization, financial development and carbon emissions for Turkey. Given the Nigeria's commitment and as a party to the Kyoto Protocol's carbon emission intensity reduction by 2030, this study provides more insight and policy relevance about the dynamic relationship among financial development, industrial production and carbon emission in Nigeria. The remaining paper is as follows. Section 2 deals with the theoretical framework, Sect. 3 is for the empirical analysis, and Sect. 4 gives the discussions of the results. Finally, Sect. 5 concludes.

2 Theoretical Framework

The theoretical framework adopted in this study is in line with Sadorsky (2010) where the financial liberalization theory ties the relationship between financial development and industrial production. The limit to growth theory connects industrial production to carbon emissions. It is based on the notion that rising production and consumption cannot be sustained forever in a finite world without consequences on the environment (Tinbergen & Hueting, 1991). Financial development is linked to industrial production via factor productivity channel where financial innovations and technologies lessen information asymmetries (Baier et al., 2004; King & Levine, 1993; Townsend, 1979). Financial development allows easier access to financial capital, either through lower borrowing costs or through new sources of financing (Gurley & Shaw, 1955; McKinnon, 1973; Shaw, 1973). Also, increased financial development makes it easier for consumers and businesses to save, invest and borrow. As development occurs within an economy's financial services sector, consumers find it easier and cheaper to borrow money and buy goods and services. Producers' motivation to maximize industrial production will lead them to expand existing operations or construct new plants and factories, all of which increase the demand for energy.

Theoretically, the relationships between financial development and carbon emissions have been mixed. Some authors suggest that financial development can help mitigate air pollution (Claessens & Feijen, 2007; Kumbaroglu et al., 2008; Li et al., 2015; Stijn & Feijen, 2007; Tadesse, 2005; Tamazian et al., 2009). These authors viewed that development of financial institutions can reduce the cost of investments and serve as a crucial way of raising funds and an important channel for firms to develop. Therefore, a firm that grows by the help of financial development will likely be more effective in its resource usage and become more efficient in its energy use. And as a result, carbon emissions are expected to diminish. A further argument is

that as firms grow and become institutionalized, their social responsibility towards achieving environment sustainability may be enhanced, which in turn can decrease carbon emissions (Li et al., 2015).

Conversely, Frankel and Romer (1999); Dasgupta et al. (2001); Sadorsky (2010); Zhang (2011); and Gokmenoglu et al. (2015) are the proponents of the view that financial development is an important source of increased carbon emissions. To establish the theoretical link between financial development and carbon emissions, the authors argued that more financial access to firms leads to more expansion and more fossil fuel emission; and this is a significant source behind high level of carbon emissions. More elaborately, the authors argued that financial development aids firms to decrease their financing costs, increase credit channels and spread operational risk, which in turn make firms able to invest more, install new facilities and increase their production capacities, hence increasing the level of carbon emissions produced.

With the development of the financial sector expected to lead the growth of the industrial sector, the increase in industrial production indicates increase energy use and more carbon emissions as the industrial sector is highly dependent on non-clean energy sources (Dasgupta et al., 2001; Frankel & Romer, 1999;Sadorsky, 2010 ; Zhang, 2011). For instance, improved finance to the oil and gas, cement production and manufacturing sector that constitute the Nigeria's industrial sector is expected to increase industrial production and subsequently worsen environmental degradation through increase in carbon emissions. Another line of thought is that financial development especially backed with government regulation and/or institutional policy towards investment into clean energy sources may help decrease carbon emissions (Claessens & Feijen, 2007; Gokmenoglu et al., 2015; Tamazian et al., 2009).

Moreover, the relationship between financial development and carbon emissions can emanate from consumption (Zhang, 2011). The argument is that financial development eases consumers' access to loans, which make them able to acquire costly items such as automobiles, bigger houses, air conditioners and so on, which cause more carbon to be emitted to the environment (Sadorsky, 2010; Zhang, 2011). Thus, empirically, Zhang (2011) has established the causal relationship between carbon emissions and financial development for China. In most recent studies, Jiang and Ma (2019) examined the relationship between financial development and carbon emission on a panel study of 155 countries from 1960 to 2014 using system generalized method of moment. The study found financial development to significantly increase emission on a global scale. Lastly, Bui (2020) investigated the direct and indirect effects of financial development on CO2 emission using a sample of 100 countries from the year 1990 to 2012. The findings, using both the two and three stage least square, showed positive direct effect of financial development on environmental quality through the energy demand and financial channels.

3 Data Source and Variable Measurement

The major data requirements for this study are financial development measure, industrial production and carbon emissions. The data is annual, and it spans from 1960 to 2018. The data is sourced from various issues of Central Bank of Nigeria (CBN) Statistical Bulletin (2018) and the World Bank Development Indicators (WDI) (2018).

Carbon emissions (CO_2): Carbon is a greenhouse gas emitted from the burning of fossil fuels and natural gases during industrial and consumption activities of solid, liquid gas fuel, gas flaring and those generated during cement production. The CO_2 is measured in kiloton (Kt). This is sourced from WDI (2018).

Financial development (FIN): Financial development is measured by credit to private sector capturing an important activity of the financial sector, which is channeling funds from savers to investors in the private sector (Ang, 2007). This is sourced specifically from the CBN Statistical Bulletin 2018. It is measured in the local unit, naira.

Industrial production (IND): This is the output of the industrial sector measured in the local monetary unit, naira. This includes oil refining and natural gas, cement production, iron ores, solid minerals, mining, quarrying and other manufacturing activities. It is measured as the share of industry in total GDP. This is also sourced from the CBN Statistical Bulletin (2018).

3.1 Descriptive Statistics of Variables

The descriptive statistics gives us insight into essential characteristics (i.e. distribution, symmetry and variability) of the variables used in the analyses. From Table 2, on the average, ₦3,170,413 billion worth of credit went to the private sector. Also, on the average, ₦3,798,443 billion worth of output was from the

Table 2 Descriptive characteristics of the series

Statistic	CRDT	IND	CO_2
Mean	3,170,413	3,798,443	57,630.48
Median	21892.5	34477.3	59,343.06
Maximum	23,536,260	33,218,330	10,4696.5
Minimum	109.3	134	3406.64
Skewness	2.51	2.09	−0.24
Kurtosis	8.14	6.23	2.04
Jarque-Bera	118.52	64.12	2.65
Probability	[0.0000]	[0.0000]	[0.2656]*

Note 1: *indicates non rejection of normality assumption given that probability value is not lower than 5% significance level
Note 2: CRDT, IND and CO_2 represent credit, industrial production and carbon emissions, respectively

industrial sector; 57,630.5 Kt carbon were emitted into the atmosphere during the period of study. The maximum CO_2 emitted during the study period was 104,696.5 Kt, while the maximum amount of credit that went to the private sector was ₦23,536,260 billion, and the maximum industrial production was ₦33,218,330 billion worth of goods. Examination of the Jarque-Bera test gives information with respect to the distribution of the series. The significance level less than 0.05% indicates the non-rejection of the null hypothesis that the test is normally distributed. Thus, on the basis of this rule, carbon emissions and interest rate can be said to satisfy the normality condition.

3.2 *Unit Root Test*

The augmented Dickey-Fuller (ADF) test (Dickey & Fuller, 1981) and the Phillips-Perron (PP) test (Phillips & Perron, 1988) as shown in Table 3 indicates that all the variables are non-stationary and integrated of order 1. This result is corroborated by the PP test also in Table 3 where all the variables are shown to be integrated of order 1, i.e. stationary after first difference. All the variables are expressed in logarithm.

3.3 *Unit Root with Break*

Following Perron (1989), unit root process in time series can induce structural break, hence the need to examine the effect of structural breaks in the series. The result as presented in Table 4 shows that structural breaks do not affect the series as they are all still I(1) after accounting for structural breaks.

Table 3 The augmented Dickey-Fuller and Phillips-Perron unit root tests with intercept and linear trend

Test	Augmented Dickey-Fuller			Phillips-Perron		
Variable	Level	First diff	Status	Level	First diff	Status
LCRDT	−2.7710	−5.11789	I (1)	−2.6745	−5.1634	I (1)
	[0.2141]	[0.0006]*		[0.2509]	[0.0005]*	
LIND	−2.3278	−6.9838	I (1)	−2.4510	−6.9829	I (1)
	[0.4122]	[0.0000]*		[0.3504]	[0.0000]*	
LCO2	−2.3405	−6.9650	I (1)	−2.2897	−7.0110	I (1)
	[0.4056]	[0.0000]*		[0.4321]	[0.0000]*	

Note 1: * indicates significance at 1%; ** indicates significance at 5%. The critical values at 1%, 5% and 10% are −4.141, − 3.497 and − 3.254, respectively

Table 4 Augmented Dickey-Fuller structural break test

Variables	Levels	Difference	Break date	Status
LCRDT	−1.8209	−6.0981	2008	I(1)
LIND	−2.596	−7.3728	1974	I(1)
LCO2	−3.3369	−7.8052	1974	I(1)

The critical values at 1%, 5% and 10% are −4.9491, −4.4436 and − 4.1938, respectively

4 Model Specification

In line with Fosu and Magnus (2006), Constant and Yaoxing (2010) and Udoh and Ogbuagu (2012), this study proceeds from the simple production function to model the relationship among CO2, industrial production and financial development in the sampled study. The industrial production function is specified as:

$$\mathrm{IND}_t = f(\mathrm{FIN}_t) \tag{1}$$

On the basis of the limit to growth model where continued industrial production leads to growth in pollution, we specify a model where environmental pollution measured with carbon emissions is a function of industrial production:

$$\mathrm{CO2}_t = f(\mathrm{IND}_t) \tag{2}$$

Theoretically, financial development drives carbon emissions through industrial production; hence we can augment Eq. (2) by incorporating Eq. (1) as:

$$\mathrm{CO2}_t = f(\mathrm{IND}_t,\ \ \mathrm{CRDT}_t) \tag{3}$$

We can specify Eq. (3) as a linear econometric model as:

$$\mathrm{CO2}_t = \alpha + \beta_1 \mathrm{IND}_t + \beta_2 \mathrm{CRDT}_t + \varepsilon_t \tag{4}$$

4.1 Methodology

To achieve the objective of this study which is to examine the dynamic relationship among financial development, industrial production and carbon emissions, we endogenize our variables and re-specify Eq. (4) as vector autoregressive (VAR) model proposed by Sim (1980). The purpose of VAR is that it helps to solve dynamic relationship among the variable of interest such as the causality analysis. In addition, it also enables researchers to examine the past history of a variable and

other related variables over itself, hence the reason for the adoption of VAR in this study. Thus, a simple VAR model can be written as:

$$\begin{aligned}
\Delta CO2_t &= \Omega_1 + \sum_{i=1}^{m} \Xi_{1i} \Delta CO2_{t-i} + \sum_{i=1}^{n} \psi_{1i} \Delta IND_{t-i} + \sum_{i=1}^{\rho} \beta_{1i} \Delta CRDT_{t-i} + \xi_{1t} \\
\Delta IND_t &= \Omega_2 + \sum_{i=1}^{m} \Xi_{2i} \Delta CO2_{t-i} + \sum_{i=1}^{n} \psi_{2i} \Delta IND_{t-i} + \sum_{i=1}^{\rho} \beta_{2i} \Delta CRDT_{t-i} + \xi_{2t} \\
\Delta CRDT_t &= \Omega_3 + \sum_{i=1}^{m} \Xi_{3i} \Delta CO2_{t-i} + \sum_{i=1}^{n} \psi_{3i} \Delta IND_{t-i} + \sum_{i=1}^{p} \beta_{3i} \Delta CRDT_{t-i} + \xi_{3t}
\end{aligned} \tag{5}$$

4.2 Lag Order Selection Criteria

In order to estimate the vector autoregressive model stated in Eq. (8), it is necessary to determine the optimal lag length of the model. To further prevent model misspecification and loss of degrees of freedom, there is the need to determine the optimal lag length before estimation. The selection of lag length rests on the outcomes of the various information criteria of which the Schwarz criterion is adjudged the most reliable. As shown in Table 5, the Schwarz criterion indicates optimal lag order of 1.

4.3 Cointegration Test

This paper employs a multivariate cointegration estimation method developed by Johansen and Juselius (1992). The VAR stated in Eq. (5) can be written in cointegration representation as:

Table 5 VAR lag selection criteria

LAG	LOGL	LR	AIC	SC	HQ
0	−20.976	NA	1.4989	1.9855	1.6794
1	53.046	127.86*	−1.5475*	−0.6960*	−1.2317*
2	58.021	4.5968	−1.2737	−0.0572	−0.8225
3	70.040	16.937	−1.4109	0.1705	−0.8244
4	87.423	22.124	−1.7919	0.1544	−1.0702
5	91.992	5.1916	−1.5905	0.7208	−0.7334

Note: * indicates lag order selected by criterion at 5% significance level. LogL, log likelihood; LR, likelihood ratio; AIC, Akaike information criterion; SC, Schwarz information criterion; HQ, Hannan-Quinn information criterion

$$\Delta Z_t = \Gamma_1 \Delta Z_{t-1} + \ldots + \Gamma_{k-1} \Delta Z_{t-k+1} + \Pi Z_{t-1} + \mu + \varepsilon_t \quad t = 1 \ldots T \qquad (6)$$

where $\Gamma_i = -(1 - \Pi_1 + \cdots + \Pi_i) i = 1 \cdots k - 1$ and $\Pi = -(1 - \Pi_1 + \cdots + \Pi_k)$. Z_t is a q-dimensional vector of stochastic variables, Γ_i are $q \times q$ matrix of the short-run coefficients, and Π is a $q \times q$ matrix of the long-run coefficients. In this paper, $Z_t = \mathrm{CO2}_t$, IND_t, CRDT_t and thus $q = 3$. The variable ordering $Z_t = \mathrm{CO2}_t$, IND_t, CRDT_t is informed by theory and from the work of Gokmenoglu et al. (2015) that carbon emission depends on industrial output and financial development. μ is the constant vector andε_t is the error term. If rank$\rho(\Pi) = 0$, Eq. (6) is a standard VAR model in first difference form and no cointegration exists in the data. If Π is of full rank, i.e. $\rho(\Pi) = q$, all Z_t series are stationary. If there is a reduced rank such that$\rho(\Pi) = r < q$, Z_t has $r$cointegration vector and $q - r$ common stochastic trends. In this case, $\Pi = \alpha\beta^{'}$ where $\alpha$and β are of the dimension $q \times r$. β means the cointegration vectors, while $\alpha$is the weights attached to them in the VAR model.

Having verified that the variables are of integrated of order one, i.e. I(1) according to the results provided by both the ADF and PP tests in Table 2, then we proceed to investigate the existence of cointegration, i.e. long-run relationship among the variables. The two test statistics assist us in deciding the number of cointegrating relationships among the series. These are the Trace and Maximum Eigen statistics as reported in Tables 4 and 5.

The decision rule for rejecting the null hypothesis for each level of cointegrating relationship from zero (no cointegrating relationship) to the three maximum cointegrating relationships is that we observe the associated probability value of the Trace statistic and Max-Eigen statistic if it is less or greater than the corresponding critical value. From the results of the cointegration in Tables 6 and 7, the null hypothesis that $r = 0$ is rejected by both the Trace and the Max-Eigen statistic, and we accept the alternative hypothesis of $r = 1$, i.e. the first vector in

Table 6 Cointegration rank test (Trace statistic)

Null hypothesis	Alternative hypothesis	Trace statistic	0.05 critical value	Prob.
$r = 0$	$r = 1$	41.07	35.19	[0.0104]**
$r \leq 1$	$r = 2$	14.71	20.26	[0.2431]
$r \leq 2$	$r = 3$	4.66	9.16	[0.3220]

Note: * indicates significance at 1%, ** indicates significance at 5%

Table 7 Cointegration rank test (Maximum Eigenvalue)

Null hypothesis	Alternative hypothesis	Max-Eigen statistic	0.05 critical value	Prob.
$r = 0$	$r = 1$	26.35	22.29	[0.0128]**
$r \leq 1$	$r = 2$	10.04	15.89	[0.3299]
$r \leq 2$	$r = 3$	4.66	9.16	[0.3220]

Note: * indicates significance at 1%, ** indicates significance at 5%

Eq. 5, where CO_2 is the dependent variable, while industrial production and financial development are the explanatory variable. As such, both the Trace statistic and Max-Eigen test indicate one cointegrating relationship among industrial production, financial development and carbon emission. This implies that there exists long-run relationship among the variables in the model. This can be interpreted to mean that the variables are moving together in the long run and one of the variables can be used to affect the others. In other words, the existence of one cointegrating vector indicates at least one direction of causality exists between the variables (Granger, 1969).

4.4 The Error Correction Term and the Causality Test

Following Engle and Granger (1987), we provide a representation of the long- and short-run cointegrating vector r = 1 of our variables in an error correction term (ECM) with lag one as:

$$\begin{aligned}\Delta \mathrm{CO2}_t = {} & c_0 + \beta_1 \mathrm{CO2}_{t-1} + \beta_2 \mathrm{IND}_{t-1} + \beta_3 \mathrm{CRDT}_{t-1} + \beta_4 \Delta \mathrm{IND}_{t-1} \\ & + \beta_5 \Delta \mathrm{CRDT}_{t-1} + \beta_6 \Delta \mathrm{CO2}_{t-1} + \lambda \mathrm{ECM}_{t-1} + \varepsilon_t\end{aligned} \tag{7}$$

Furthermore, the cointegration results provided in Tables 5 and 6 have provided indications to the existence of causality between the variables of interest. However, it is yet to indicate the direction of causality between the variables. For this purpose, we adopt a bivariate Granger (1969) causality model of our variables which is represented as:

$$\begin{aligned}\Delta \mathrm{CO2}_t &= c_1 + \sum_{i=1}^{m} \beta_i \mathrm{CRDT}_{t-i} + \sum_{i=1}^{n} \alpha_i \mathrm{IND}_{t-i} + \varepsilon_{1t} \\ \Delta \mathrm{IND}_t &= c_2 + \sum_{i=1}^{m} \theta_i \mathrm{CO2}_{t-i} + \sum_{i=1}^{n} \pi_i \mathrm{CRDT}_{t-i} + \varepsilon_{2t} \\ \Delta \mathrm{CRDT}_t &= c_3 + \sum_{i=1}^{m} \eta_i \mathrm{CO2}_{t-i} + \sum_{i=1}^{n} \lambda_i \mathrm{IND}_{t-i} + \varepsilon_{3t}\end{aligned} \tag{8}$$

where c_1, c_2 c_3 are the constant terms, $\Delta \mathrm{CO2}_t$, $\Delta \mathrm{IND}_t$ and$\Delta \mathrm{CRDT}_t$ in their first difference which are dependent on the past history of one another, while ε_{1t},ε_{2t} ε_{3t} are the error terms, respectively. The results of the long-run and the short-run effects with the ECM term and the causality test are presented in Tables 7 and 8.

Table 8 The result of the long, short run and the ECM term. Dependent Variable: CO2

Variables	Coefficient	Std. error	*t*-Statistic	*p*-Value
IND(−1)	4.087	1.1913	3.4315	0.00***
CRDT(−1)	−4.0689	1.1955	−3.4007	0.00***
Δ CO2(−1)	0.017	0.1434	0.1186	0.51
Δ IND (−1)	0.2115	0.1282	1.6506	0.13
Δ CRDT(−1)	−0.1245	0.2509	−0.4964	0.34
ECM(−1)	−0.024	0.0176	−1.3642	0.86
Variables	**Dependent variable: IND**			
CRDT(−1)	−0.9923	2.8934	−5.7823	0.00***
CO2(−1)	0.1897	1.7823	0.1426	0.12
Δ CO2(−1)	−0.1911	0.1829	−1.0452	0.56
Δ IND (−1)	0.1378	0.0716	0.8493	0.42
Δ CRDT(−1)	0.0637	0.3148	0.2024	0.28
ECM(−1)	−0.0122	−0.0122	−0.6859	0.96
Variables	**Dependent variable: CRDT**			
CO2(−1)	−0.1913	0.4521	−2.1561	0.29
IND(1)	−1.0078	1.8934	−4.1978	0.00***
Δ CO2(−1)	0.0378	0.0716	0.5274	0.73
Δ IND (−1)	−0.0015	0.0635	0.8555	0.91
Δ CRDT(−1)	0.1054	−0.0015	−0.0231	0.22
ECM(−1)	0.0276	0.0071	3.9662	0.00***

*** indicates 1% significance level

5 Results and Discussion

The long-run result is shown in Table 8 for three models (model1, CO2, IND, CRDT; model 2, IND, CO2, CRDT; and model 3, CRDT, IND, CO2).

The result of model 1 indicates that in the long run, industrial production has a significant and positive relationship with carbon emission at 1% significance level over the study period, with a coefficient of 4.0870. This implies that one percent increase in industrial production leads to 4.07% increase in carbon emission in the long run. On the other hand, we found financial development measured as credits to the private sector to have a negative relationship with carbon emission in the long run. One percent increase in financial development leads to 4.07% decrease in carbon emission at 1% significance level. This result is in support of previous studies like Tamazian et al. (2009) and Li et al. (2015) which assert that financial development helps industries through credit accessibility to adopt clean technologies which result to low-carbon emission.

In the short run, we found the immediate past value of carbon emission to insignificantly affect current carbon emission. 1% increase in the previous emission insignificantly increases the current emission by 0.02%. Moreover, we also found industrial production to have insignificant positive effect on carbon emission in the short run. 1% increase in industrial production increases carbon emission by 0.21%

Table. 9 The result of the Granger causality test

Null hypothesis	Obs	F-stat.	Prob.
IND does not Granger cause CO2	59	0.4404	0.509
CO2 does not Granger cause IND		0.0117	0.914
CRDT does not Granger cause CO2	59	0.2525	0.753
CO2 does not Granger cause CRDT		3.7227	0.059**
CRDT does not Granger cause IND	59	0.0726	0.788
IND does not Granger cause CRDT		24.611	0.000*

Note: * and ** denotes the rejection of the null hypothesis at 1% and 10% level of significance

insignificantly in the short run. In contrast, financial development is found to have a negative and insignificant effect on carbon emission. 1% increase in financial development results in 0.12% reduction in carbon emission in the short run. Lastly, the error correction term (ECT) is negative as expected but not statistically significant with a coefficient of −0.02. The ECM suggests that the deviation of variables from the short- to the long-run equilibrium is small and insignificantly adjusted by 2% per year. The insignificance level of the error correction term confirms the insignificant effects of financial development on carbon emission in the short run.

The causality result in Table 9 shows that the null hypothesis that industrial production does not Granger cause financial development is rejected at 5% significance level. Also, the null hypothesis that carbon emission does not Granger cause financial development is rejected at 10% level of significance. The causality results imply that there are unidirectional causalities. First, the growth of financial development is driven by growth in industrial production. Second, there is a unidirectional causality running from carbon emission to financial development. The unidirectional causality that carbon emission Granger causes financial development in our results confirms the long-run negative effect of financial development on carbon emission and also explains this unidirectional causality. As carbon emission increases due to increase in industrial production and capacities, the increase in demand for more funds would cause development in the financial system to provide funds for adoption of low-carbon technologies which would further mitigate the environmental effects of the initial emission. The outcome of the causality results that both industrial production and carbon emission Granger cause financial development is therefore reasonable and consistent because carbon emission is a by-product of industrial production. For model 2, financial development is found to negatively affect industrial output in the long run at 1% significance level. 1% increase in financial development would reduce industrial output by 0.99%. On the other hand, the short-run and the ECM results are not significant. The results of the third model are different. Although the short-run results are not significant, the ECM term is significant. The long-term result shows negative and significant effect of industrial output on financial development. 1% increase in industrial output would reduce financial development by 1.01%. Lastly, the ECM term is negative and significant at 1% with a value of −0.03.

We further carried out a robustness check of our result using impulse response function. The result shows carbon emission to respond with positive shock to itself. We further found the response of carbon emission to financial development shocks to be zero throughout the period of study. On the other hand, the response of carbon emission to industrial shock is positive with 0.5% over the horizon. Also, the responses of financial development to carbon emission shocks and industrial output are positive throughout its horizon at 1% and 2%, respectively. Lastly, the response of industrial output to emission, itself and financial development is also positive. The industrial output response to emission shock is 1%, to itself is 3%, while it is 0.5 to financial development. Finally, it is found out that the positive and significant effects of industrial output realized in the ECM model corroborate the result of the impulse response function (Fig. 1).

The diagnostic tests that show the stability and the goodness of fit of our model are presented at the appendix section. The roots within the unit circle suggest the stability of our model, while the non-rejection of the VAR residual serial correlation LM tests at 5% significance level implies absence of residual correlation. All these are indications of unbiasedness and reliability of our results. See the Appendix section for the diagnostic tests.

6 Conclusions and Policy Implication

This study investigated the dynamic relationship among industrial production, financial development and carbon emission in Nigeria. This study is important given the commitment of Nigerian government to the Kyoto Protocol of achieving low-carbon economy by the year 2030 as an oil-producing country. The role financial system plays in contributing to carbon emission of industries would be crucial to the attainment of the Kyoto Protocol. The cointegration result showed that long-run relationship exists among industrial production, financial development and carbon emission. The existence of long-run relationship among the variables is confirmed with the long-run significant impacts of both industrial production and financial development on carbon emission. We conclude that industrial production has a significant positive effect on carbon emission, while financial development has a significant negative effect on carbon emission in Nigeria in the long run. This means that industrial output increases emissions, while financial development reduces it. The same result is also found for the effects of industrial production and financial development on carbon emission in the short run though the effects are not significant. The causality results show both industrial production and carbon emission are the drivers of financial development in Nigeria.

Our findings have policy implications. The significant positive effect of industrial production on emission in the long run indicates that long-term industrial and energy policies that would support the increasing use of less carbon and renewable energy in

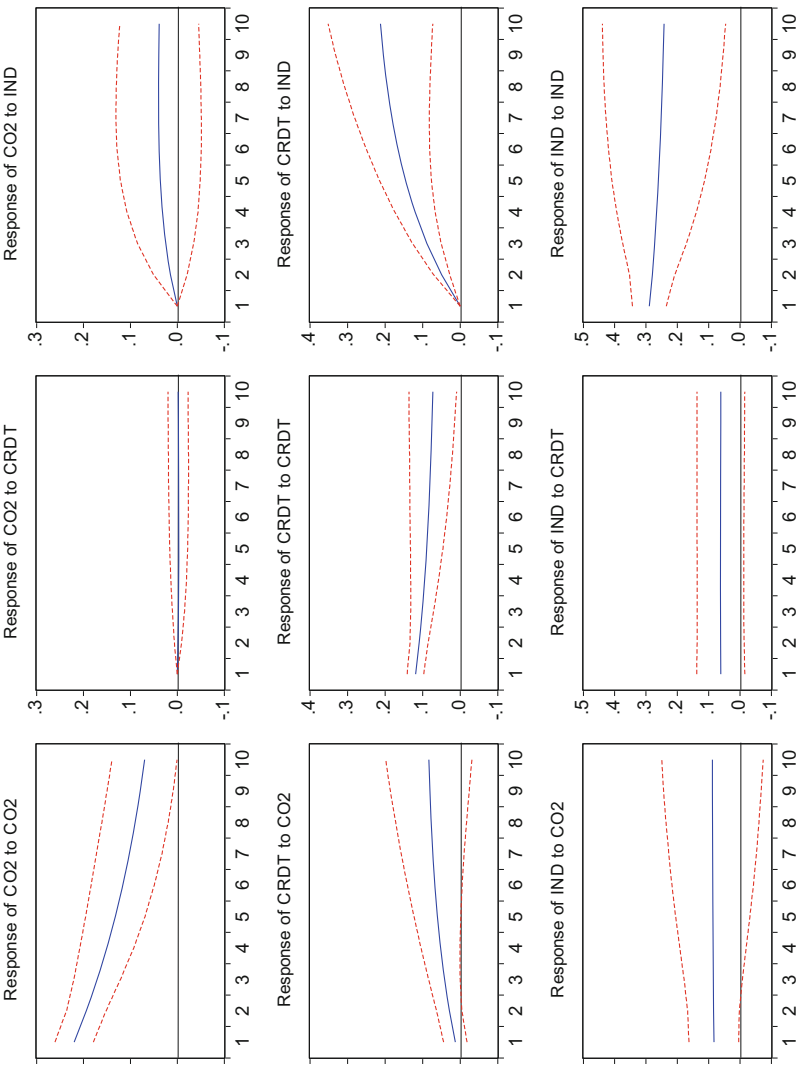
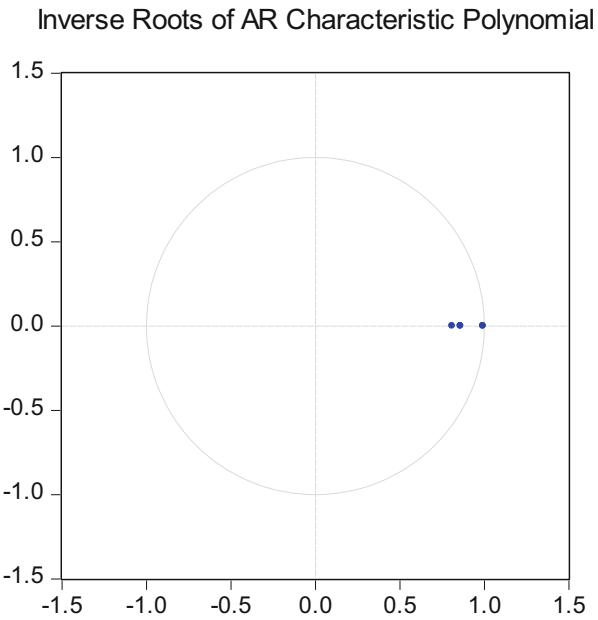


Fig. 1 Impulse response result

production process should be adopted by the industrial and energy sectors in the country. The financial authorities in Nigeria should continue to channel their loans and funds into projects, products and companies that show commitment to low-carbon emission in their production processes given the negative long-run effect of financial development on carbon emission. In conclusion, a more practical way of using financial system and its institution to reduce carbon emission is by interacting Nigerian Federal Ministry of Environment with the Central Bank of Nigeria to offer special loans with lower discount rate to projects that are environmentally friendly. This is with a view to ensuring a more sustainable, low-carbon, climate-resilient economy and as one of the means to achieve the Kyoto Protocol of reduction in global warming in the future.

Appendix

Appendix 1



Appendix 2

VAR Residual Serial Correlation LM Tests		
Null hypothesis: no serial correlation at lag order h at 0.05 significant level		
Date: 10/29/16 Time: 13:45		
Sample: 1960 2018		
Included observations: 54		
Lags	LM-stat	Prob
1	4.479779	0.8771
2	6.578330	0.6809
3	16.11746	0.0645
4	6.905032	0.6470
5	6.027324	0.7372
6	13.19203	0.1541
7	3.338755	0.9493
8	5.724759	0.7671
9	4.022587	0.9099
10	11.46377	0.2453
11	7.578045	0.5772
12	12.68451	0.1774

Probs from chi-square with 9 df

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Corporate Finance and Financial Development: A Conclusion

Shame Mugova and Joseph O. Akande

Abstract The present volume reviewed the corporate finance and financial development within emerging markets context. The culmination of the contributions unveiled some of the corporate finance issues that bother on financial development in the emerging markets of Asia and Africa. The contributions unveiled theoretical, policy, and practical implications for improving corporate finance and financial development for the growth of the emerging market economies. Financial development is largely underpinned by ICT development and innovation of financial services in emerging markets.

Keywords Financial development · Emerging economies · Financial innovations · Banking · Capital · Financial markets · Emerging markets

Financial development in emerging economies has been spurred by financial technology because firms are adopting technology to automate financial services and processes. Financial innovations reduce the barriers to financial inclusion such as lack of access to banking services which increases economic growth resultantly. Economic growth increases financial development which is the primary source of firms' innovations in emerging markets. Capital access, income inequality, and significant unbanked population are some of the common challenges of Africa and Asia low-income countries. This volume explored various issues pertaining to emerging markets financial development, and the contributions to theory and practice help to shape agenda and policy in these markets. Our contributors Moheddine Younsi and colleagues analyzed whether financial development and economic

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growth will decrease income inequality in Asian and North African countries; their major finding is that a long-run rise in real income per capita reduces inequality.

Financial development is also dependent on the development of information communication technology (ICT) infrastructure which enables innovation and distribution of financial services. Our contributors Owoeye and colleagues studied ICT diffusion as a possible catalyst causing financial development to affect economic growth in sub-Saharan Africa. While mobile phone subscribers, fixed telephone and broadband users have increased in Africa there has been no meaningful financial development. The possible reason could be the inability of private credit to drive output expansion and the challenge of financial inclusion in Africa which has persisted despite the increased use of mobile phones, for instance. ICT infrastructure provides the enabling environment for financial services innovation. Therefore, innovation and development of financial services for offering through the mobile phones should happen first before financial development is realized.

Market-based financial development and financial innovation in the financial system can spur economic development (Qamruzzaman & Wei, 2018). ICT adoption has a positive influence on stock market development in emerging economies particularly in Africa. Stock market traded volume and mobile telephone user variables such as broadband are positively related (Igwilo & Sibindi, 2022). Financial technology democratizes financial access and promotes financial inclusion (Tan, 2021). Technological advancements have increased access to financial markets through *online* brokerage accounts and *trading platforms. The digital platforms have improved financial intermediation and may result in increased rate of financial development.* The offering of investment platforms online has increased financial literacy which leads to financial development as retail investors self-teach themselves. A range of financial products are now traded online such as foreign currency, stocks, futures, and options including commodity derivatives.

Small and medium enterprises are dominant in Africa and require capital for financing growth. Our contributor Ismail J. Ismail examined dynamic capabilities and financial performances, particularly when mediated by financial resource development in Tanzania. His contribution is that dynamic capabilities such as sensing, seizing, learning, and transforming significantly correlate with financial resource development. Financial resource development involves the process of financial acquisition, maintenance, and advancement. The managerial capabilities of entrepreneurs enable them to access credit and apply appropriate credit management resulting in financial performance. Financial development is the avenue to mobilize resources for entrepreneurial growth and the capabilities of entrepreneurs is required to realize full potential.

Our contributors Shreya Biswas and Arnab Mukherjee studied board diversity and bank outcomes in India; young and female directors are few, but however this does not affect return on assets. Their major finding is that having a higher share of directors with economics, finance, or management education is related to lower credit risk of banks given by gross non-performing assets to total advances and net non-performing assets to total advances ratios. Shreya Biswas and Nivedita Sinha also examined the effect of bank mergers in India on the cost of raising debt and

equity for merger-affected firms. Their conclusion is that the bank mergers in India result in higher overall cost of capital for the borrowers of merger banks, and the higher cost of capital is driven by the higher cost of equity for the firms. The higher cost of equity is attributed to the investor's perceived higher risk in the medium term. Bank mergers can reduce monitoring of borrower firms in the post-merger period owing to more time being devoted to bank merger-related operational issues. The shareholders' fear of reduced monitoring increases the agency problem in emerging market economies which might translate to a higher cost of equity for the borrower firms.

Machine learning has been advancing at a quicker pace and banks have adopted systems that enable automation of their services. Machine learning enables banks to report more accurately by automating credit risk. Machine learning facilitates the revaluation of a consumer's financial history and make accurate forecasts of future spending and income. Automated risk assessment enables banks to automatically offer the best possible terms for loans and credit products to customers based on their risk. The advancement of financial services has enabled banks to offer multi-channels to their clientele and meet customer needs. Banking applications, Internet, and mobile banking are some of the channels that have ensured there is also quality financial development.

The rise of Bitcoin has brought attention not only to digital currencies but also to the underlying technology empowering digital currencies: blockchain technology (Chen, 2018). In the developing world, Bitcoin is seen as a safe harbor during financial crisis despite its volatility. A few countries have legalized Bitcoin and made it legal tender and other cryptocurrencies. Financial development is deterred by poor central bank management of currency and poor financial systems and policies. Weak currencies are also function of lack of confidence in the central banking institutions probably because of reckless printing and failure to manage inflation. Decentralized finance has the promise of doing away with problems of central banks and providing people with an alternative of sound money. Decentralized finance aims to provide financial services without intermediaries, using automated protocols and blockchain and stable coins to facilitate fund transfers (Aramonte et al., 2021). New systems of payment systems have emerged such as transacting through blockchain and partnerships such as Litecoin has with platforms such as visa, Google Pay, and apple pay. While crypto assets are rising, some argue that they represent a threat to global financial stability due to their scale, structural vulnerabilities, and increasing interconnectedness with the traditional financial system (Financial Stability Board, 2022).

Our contributors Dauda Olalekan Yinusa and colleagues investigated the moderating role of the real sector on the financial development-economic growth nexus using panel data consisting of 38 sub-Saharan African countries. Their major finding is that a well-developed real sector is required for the optimum impact of financial development on economic growth. The relationship between economic growth and financial development and whether this affects income inequality are very important in developing policy. The growth of the financial sector which increases

inclusiveness through mobile money and other technologies reduce the income inequality problem.

Economic challenges following the global pandemic is that disparities that were already challenging societies are now expected to widen—51 million more people are projected to live in extreme poverty compared to the pre-pandemic trend (World Economic Forum). Debt crises remain a potential risk for countries, firms, and individuals. The income inequality and areas with low income negatively affects economic growth, the infrastructure and technology for financial services are usually lacking, and a lack of access to financial services and capital mean business and entrepreneurship development is constrained. Financial innovation which leads to financial inclusion is necessary to ensure economic growth in countries with poorly developed financial sectors. The increase in financial inclusion leads to greater financial development and financial innovation to meet the emerging demand for more financial services.

Financial crisis precedes working capital constraints, and financial stability is determined by the development of the financial sector. Financial sector development reduces the costs of external finance to firms. Financial development improves access of companies to funding; therefore this should reduce both the cost of capital and the differential cost of external finance. World capital markets are not perfectly integrated; therefore domestic financial sector development is critical for local industry development within a country. Firms operating in countries with advanced stock markets can borrow more from equity markets and reduce their use trade credit. The ability of a firm to raise capital through equity markets, money markets, and bond markets is entirely dependent on financial development.

Our contributor Younesse El Menyari studied FDI and international tourism on financial development in 48 African countries. The major finding of the study is that FDI and tourism receipts have a positive influence on broad money and domestic credit to private sector. Foreign direct investment (FDI) and tourism receipts are an important driver of financial development in Africa. Capital flows in the form of FDI will improve broad money and domestic credit to private sector. Emerging economies and African countries need the right policies and financial systems that attract capital flows including remittances.

Financial stability is critical for business; the banking sector is very important for business and transactions in an economy. Bank runs have a contagion effect, and the cost and negative effects of a bank run damage the economy, hence the need for efficient risk management and regulations. Banks that are more concentrated are less vulnerable to liquidity or macroeconomic shocks (Ali et al., 2015). In many industrialized countries, banking is a highly concentrated industry unlike in the developing world. In South Africa, an emerging economy, the top five banks control 90% of the market, while the total banking entities are 31 (Business Tech, 2020). Higher banking concentration is desirable because it increases corporate debt (Hake, 2012). This is due to banking concentration making it more efficient to share information and improve the standards (Jappelli & Pagano, 2006).

Financial markets in emerging markets have expanded rapidly and simultaneously with economic growth (Sharma & Manhas, 2015). Higher levels of credit

to the private sector and financial depth in emerging economies will result in higher levels of economic growth. Samargandi and Kutan (2016) found empirical evidence that credit to the private sector has a positive spillover effect on growth in China and India. Economic globalization has led to growing integration of financial markets, both within emerging markets and other countries. Banks need to attract deposits before they can lend; therefore, confidence in the banking system is very important. Emerging markets and developing countries rank lower terms of the rule of law index; such an institutional environment does not promote credit. Financial sectors lack ability to attract high levels of deposits and savings due to confidence in their banking sectors.

The development of an economy's financial markets is closely related to its overall development. Well-functioning financial systems provide sound and easily accessible information which can lower transaction costs and subsequently improve resource allocation and boost economic growth. Both banking systems and stock markets enhance growth, which is the main factor in poverty reduction. There is need for consistent financial sector development, that is, the development of both financial institutions and financial markets (stock markets). Financial sector development will also lead to improved and advanced financial systems, which facilitate transactions and payments.

Digital financial services (DFS) have rapidly expanded across Africa and other low-income countries. The growth in financial inclusion rates in many low-income countries over the past decade was due to the increasing penetration of digital financial services, particularly mobile money (Munoz et al., 2022). Developing countries also face the challenge of taxing the digital economy such as whether money transfers or transactions should be taxed. The increase in financial inclusion is likely to increase financial development and business growth as small business may have access to credit through mobile money systems. Central Bank Digital Currency (CBDC) currently being experimented by China and other countries could eliminate the need for cash. The potential for central banks to issue digital currencies using the blockchain technology could also influence financial development as it changes traditional banking.

Freer capital mobility is desirable for developing countries because it increases economic growth where the banking sector is better developed to increase lending activities. Exchange control regulations which control the inflow and outflow of foreign currency need to be favorable to attract capital. Polices to attract foreign direct investment and a stable financial system which nurtures investor confidence can contribute meaningfully to financial development of African and other low-income countries.

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